VOL. LXXXIV PART NINE

JOURNAL OF THE ROYAL HORTICULTURAL SOCIETY

SEPTEMBER 1959

PAGE

The Secretary's Page 393

Notes from Wisley. By N. K. GOULD 397

Invited Trials, 1960–61 399

The Pruning and Staking of Shrub Roses. By V. SACKVILLE-WEST, C.H. 402

The Lily Conference, 1959 405

Mixed Borders. By C. LLOYD 411

Magnolias at Kew. By S. A. PEARCE 418

Bird Damage to Horticultural Crops. By E. N. WRIGHT, B.Sc. 426

Book Notes 434

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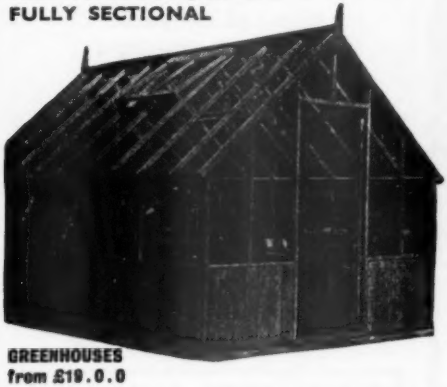

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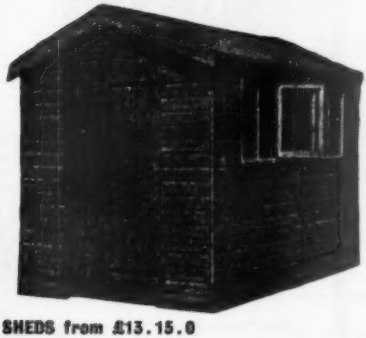

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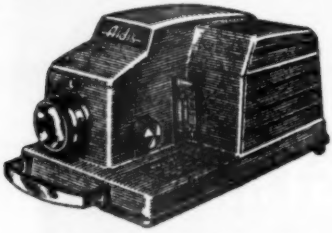

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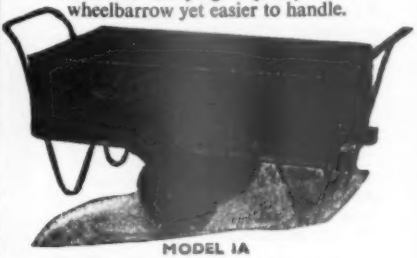

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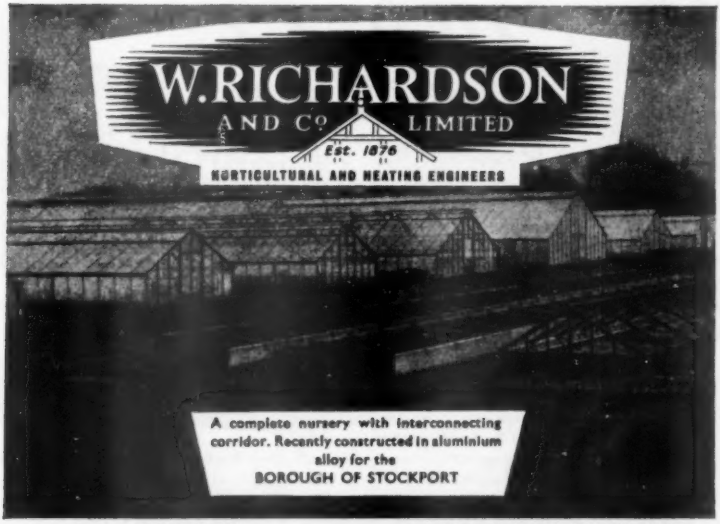
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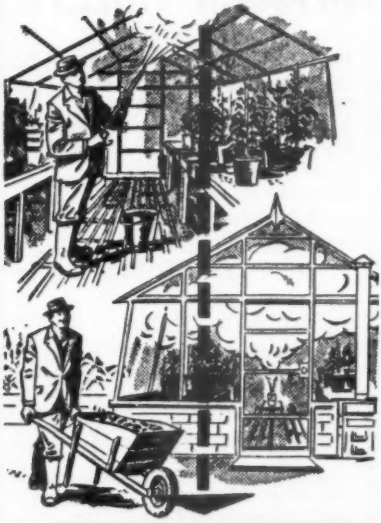

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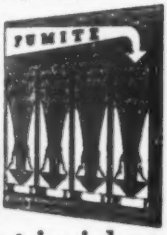

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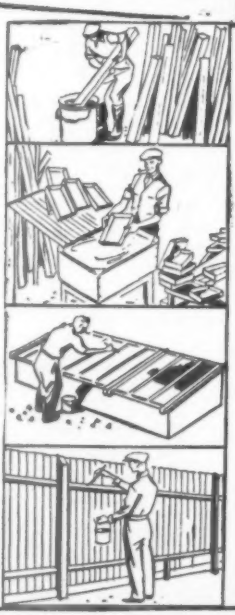

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JOURNAL OF THE ROYAL HORTICULTURAL SOCIETY

VOL. LXXXIV PART NINE

September 1959

THE SECRETARY'S PAGE

ANNOUNCEMENTS—SEPTEMBER AND OCTOBER

Shows

TUESDAY, September 1 12 NOON to 6 P.M. WEDNESDAY, September 2 10 A.M. to 5 P.M.	Fortnightly Flower Show, in the New Hall.
TUESDAY, September 8 1 P.M. to 7.30 P.M. WEDNESDAY, September 9 10 A.M. to 5 P.M.	National Dahlia Society's Show, in both Halls.
FRIDAY, September 11 11 A.M. to 7 P.M. SATURDAY, September 12 10 A.M. to 5 P.M.	National Rose Society's Show in both Halls on September 11; New Hall only on September 12.
TUESDAY, September 15 12 NOON to 6 P.M. WEDNESDAY, September 16 10 A.M. to 5 P.M.	Fortnightly Flower Show, Alpine Garden Society's Competition and Cactus and Succulent Society's Competition, in the New Hall.
FRIDAY, September 18 1 P.M. to 7.30 P.M. SATURDAY, September 19 10 A.M. to 6 P.M.	National Chrysanthemum Society's Show, in both Halls.

Shows—*continued.*

TUESDAY, September 29 12 NOON to 7 P.M. WEDNESDAY, September 30 10 A.M. to 7 P.M. THURSDAY, October 1 10 A.M. to 5 P.M.	**Great Autumn Show**, in both Halls.
TUESDAY, October 6 12.30 P.M. to 6 P.M. WEDNESDAY, October 7 10 A.M. to 5 P.M.	Fruit and Vegetable Show, in the New Hall.
TUESDAY, October 13 12 NOON to 6 P.M. WEDNESDAY, October 14 10 A.M. to 5 P.M.	Fortnightly Flower Show, in the New Hall.
TUESDAY, October 27 12 NOON to 6 P.M. WEDNESDAY, October 28 10 A.M. to 5 P.M.	Fortnightly Flower Show, Tree and Shrub Competition and British National Carnation Society's Competition, in the New Hall.

Lectures

TUESDAY, September 1, at 3 P.M. "Flowering Succulents", by MR. G. D. ROWLEY, B.SC.

TUESDAY, September 15, at 3 P.M. "The Newer Roses", by MR. F. FAIRBROTHER, M.SC., F.R.I.C.

TUESDAY, September 29, at 3 P.M. "Early-flowering Chrysanthemums", by MR. J. B. STEVENSON.

TUESDAY, October 6, at 3 P.M. "The National Fruit Trials", by MR. J. M. S. POTTER, N.D.H.

TUESDAY, October 13, at 3 P.M. "Gardening on Heavy Clay Soils", by THE HON. SIR DAVID BOWES LYON, K.C.V.O., V.M.H.

TUESDAY, October 27, at 3 P.M. "Trees and Shrubs for Shelter Purposes", by MR. F. W. SHEPHERD, N.D.H.(HONS.).

Great Autumn Show—Alteration of Closing Times—Arrangements have been made for the Great Autumn Show to be kept open until 7 P.M. on Tuesday and Wednesday, September 29 and 30. This was arranged after the annual tickets were printed, so the times given on them should be amended. The Show will close at 5 P.M. on Thursday, October 1.

Demonstration at Wisley—On Wednesday, September 23, there will be a demonstration on Digging, Manuring and Composting at Wisley, commencing at 2 P.M. The demonstration will be repeated at the same time on Thursday, September 24.

Joint Chrysanthemum Committee Meeting at Sheffield—The Joint Chrysanthemum Committee will meet at the Sheffield Chry-

santhemum Society's Show in the Edmund Road Drill Hall, Sheffield, on Thursday, September 24, to consider new varieties submitted to it. Forms for submitting varieties to the Joint Committee may be obtained from the Secretary of the Committee on the morning of September 24, or beforehand from The Secretary, The Royal Horticultural Society, Vincent Square, London, S.W.1, or The Secretary, The National Chrysanthemum Society, 83 Chesterfield Road, Barnet, Herts. Completed forms, together with the exhibits to which they relate, should be handed to the Secretary of the Joint Committee before 12 NOON on Thursday, September 24.

Lily Group Meeting—The Lily Group will hold a meeting in the Lecture Room in the New Hall on Tuesday, October 13, at 4.30 P.M., when there will be an exhibition of coloured lantern slides.

The Society's Examinations—The Preliminary Examination for the National Diploma in Horticulture will be held on Saturday, November 21, 1959. The closing date for entry is October 1, 1959.

International Orchid Conference, 1960—The Third World Orchid Conference, which is being sponsored jointly by the American Orchid Society, the British Orchid Growers' Association and The Royal Horticultural Society, will be held in London in 1960. The first conference was held in St. Louis, Missouri, U.S.A., in 1954, and the second in Hawaii in 1957.

The exhibition of orchids arranged in connexion with the Conference will be staged at the Chelsea Show on Tuesday, Wednesday, Thursday and Friday, May 24–27, and the Conference will be held in the following week on Monday, Tuesday, Wednesday and Thursday, May 30 and 31, June 1 and 2. Excursions to leading orchid growers' establishments will be arranged on Friday and Saturday, May 27 and 28 and Friday, Saturday and Sunday, June 3, 4 and 5.

A joint committee of the three sponsoring bodies is arranging a comprehensive programme covering a wide range of subjects of interest to amateur and professional orchid growers is being arranged, and orchid specialists from Australia, Belgium, Ceylon, Colombia, England, France, Germany, Japan, Malaya, South America, Sweden and the United States of America have already accepted invitations to deliver papers.

The Preliminary Programme will be available this month and anyone who wishes to have a copy should write to The Secretary, The Third World Orchid Conference, c/o The Royal Horticultural Society, Vincent Square, London, S.W.1. Those who have already notified their interest in the Conference need not apply as a copy of the Preliminary Programme will be sent to them.

Restaurant at Wisley—The Restaurant at Wisley will be closed after October 4. It will re-open in 1960 on a date to be announced.

Delay in publication of the Journal—The Council regrets that the dispute in the Printing Industry has resulted in delay in the publication of the Journal. Every effort is being made to resume punctual publication as soon as possible.

THE JUDGING OF FRUIT AND VEGETABLES

As reported in the JOURNAL for April, at the Annual General Meeting, held on February 24, the following resolution was adopted:—

"That as edible fruits and vegetables are grown for human consumption, the Council consider the advisability of instructing the judges of competitions that, in assessing the merits of fruits and vegetables, first consideration be given to the edible and (where applicable) the culinary qualities of the exhibits."

The Council accordingly referred the matter to the Fruit and Vegetable Committee and asked it to report whether it considered it desirable that the Council should issue any fresh instructions to judges of fruit and vegetables. In due course the Council received the following report from the Committee.

"In accordance with the Council's request my Committee has considered the resolution adopted at the last Annual General Meeting. We are of opinion that the judges whom it is the custom of the Council to appoint to adjudicate at the fruit and vegetable competitions held by the Society normally attach appropriate importance to the edible and, where applicable, the culinary qualities of the exhibits.

We are unanimously of opinion that it is not necessary nor practicable for the judges to taste all, or even the majority, of the exhibits, but where it is deemed necessary and practicable to taste particular exhibits it is the practice of the judges to do so.

In our opinion it is not necessary for the Council to issue any fresh instructions for the guidance of judges.

F. A. SECRETT,

Chairman,
Fruit and Vegetable Committee."

The Council adopted the report.

NOTES FROM WISLEY

N. K. Gould

WITH the arrival of September come many reminders that autumn is approaching. The cool misty mornings, the heightening colour in many berries and leaves and the abundance of dahlias and chrysanthemums are among these signs; but above all the sudden appearance of flowers on certain bulbous plants seems to proclaim that a new season is beginning.

At Wisley, there is a very good collection of autumn-flowering bulbs. The varieties of *Amaryllis belladonna* can be seen just inside the main gate, in the Half-Hardy House, near the frameyard wall and in the A.G.M. collection. From conversation with visitors to the Gardens, one concludes that these lovely plants are grown by comparatively few amateurs and that there is an idea that they require very special treatment. All the bulbs really need is to be planted 6 or 8 inches deep in a well-prepared bed of fibrous loam with a little leaf mould, sand and bone meal at the foot of a warm sunny wall where there is room for their ample spring foliage to develop fully without being crowded by other plants. Like other bulbs they require a reasonable quantity of water during growth, and some failures may well be due to dryness at a critical time. In similar circumstances *Nerine bowdenii*, which has smaller pink flowers, should also be a success.

The autumn-flowering species and varieties of *Colchicum* are almost indispensable and they are well suited for planting near the front of shrub borders or in some other place where their abundant foliage may grow unrestricted. The huge leaves, dying away in an untidy fashion in late spring, make them unsuitable for mixing with smaller plants of less rampant growth. The bulbs may seem costly at two or three shillings each, but every one will send up several flowers, even twenty or more in the case of *C. cilicicum*, and if treated well they increase quickly.

In the smallest garden there must be space for some autumn-flowering crocuses. The cost of such species as *C. kotschyanus* and *C. speciosus* is almost negligible, but their blooms opening widely on a sunny morning are exquisite. The protection of a cold greenhouse or frame is desirable for most of the late autumn and winter-flowering crocuses and they make very attractive pot plants when there is little else in the garden. A few we could recommend are *C. ochroleucus*, creamy white, *C. dalmaticus*, porcelain blue, *C. imperati*, fawn outside and violet within, *C. sieberi*, lavender blue, and *C. vernus* 'Vanguard', pale blue and French grey.

A great many people grow bulbs indoors in pots or glazed bowls to provide flowers early in the New Year and, although this can be done without great difficulty, a large number of letters received at Wisley report disappointing results. These include failure of bulbs to produce

roots, leaves too long and weak and flower buds either not appearing at all or withering without expanding. Nearly all cases can be traced to improper treatment; very rarely can the vendors of the bulbs be held responsible. Perhaps, therefore, a few directions may be of assistance to some readers of these notes.

Perhaps the most important point to emphasize is that the indoor cultivation of bulbs is something quite different from forcing, which can only be achieved by an experienced grower who has at his disposal proper glasshouse accommodation with control of temperature, humidity and intensity of light. Growing the plants indoors can only be expected to advance their flowering dates by a matter of a few weeks.

The choice of varieties requires some care, and the best catalogues will be found helpful in this matter, as they indicate the height to which different varieties grow and their respective earliness or lateness. Most single-flowered hyacinths can be grown indoors and a few which are perhaps particularly suitable are 'Arentine Arendsen', a large pure white bell, 'Bismarck', light lavender blue, 'Jan Bos', bright red, and 'Princess Margaret', pale pink. These have slightly different flowering dates so it is unwise to mix the varieties in a pot or bowl, but several bulbs of one variety may be expected to open at once.

For ordinary purposes, the second size bulbs are quite large enough unless required to be grown in glasses, when one should choose the largest available. Apart from the ordinary range of varieties, there are the small-flowered group known as "Cynthella Hyacinths" and also the so-called "Multiflora" varieties in which each bulb sends up several graceful spikes.

Nearly all varieties of daffodils are suitable for growing in pots or bowls but, here again, those with rather short stems are preferable. The group known as "Poetaz" or "Tazetta" Narcissi lend themselves very well to this kind of treatment and most of them produce several flowers from one bulb. 'Cragford', which can be grown to flower soon after Christmas, has a sturdy stem bearing several large flowers with a pure white perianth and a scarlet cup and is very reliable. For earlier flowering the "Paperwhite" Narcissi are to be recommended but, in this case, only the best quality bulbs are worth planting and the same remarks apply to the 'Grand Soleil d'Or', which is the deep yellow and orange bunch-flowered variety which appears in the shops before Christmas.

In choosing tulips those who have little experience in growing bulbs indoors should confine their choice to the early-flowering, single and double types which can be grown without much difficulty.

It is possible to obtain what are called "prepared" bulbs which can be relied upon to produce earlier flowers than the ordinary ones. The preparation, which is done by the grower, consists of lifting the bulbs at a certain definite date and for the part of the time they are in store keeping them at a pre-determined constant temperature. This is a highly specialized procedure and cannot be undertaken by amateurs.

For all these kinds of bulbs a good mixture of loam with a little sand and peat should be used for pots and a prepared bulb fibre containing crushed charcoal for bowls without drainage holes. The fibre can be purchased without difficulty from any sundriesman and the usual domestic stores. The bulbs require to be planted firmly, as soon as they are received, in moist fibre or soil and they must then be stored in a cool but frost-proof place for some weeks during which they will be producing roots and the first growth of the flowering shoot. It is often advised to plunge the pots out-of-doors and to cover them with several inches of peat or ashes, but this is frequently inconvenient and the pots or bowls can well be housed in a cool cellar or a garden shed. It may be necessary to water them periodically, and it is most important that the roots should never become quite dry. This undoubtedly is a frequent cause of failure. When the shoots are about 2 or 3 inches above the surface, the pots or bowls may be brought indoors and stood in a room where the temperature is not more than 50 degrees Fahrenheit and where they are screened from full daylight. They can remain so for a few days before being brought into full light. Many people make the mistake at this stage of bringing the bulbs into a hot room, which has the effect of causing vigorous growth of the leaves but causes the flower to respond less actively. If left in the cool room for a little longer, the flower bud will emerge from the bulb and more or less keep pace with the growth of the foliage, and when it is well out of the bulb, the temperature may be somewhat increased.

Attention to watering is important at all times and the fibre in glazed bowls should never be waterlogged and never dry.

Despite satisfactory growth in the early stages, it is quite possible for the expanding flower to be injured by exposure to fumes from gas or paraffin fires.

When flowering is over, every effort should be made to keep the plants growing by attention to watering until the foliage dies away, when they can be removed from the containers and planted in the open garden.

INVITED TRIALS, 1960–61

The Royal Horticultural Society will carry out at its Gardens during 1960–61 the following trials, for which entries are now invited:

FLOWERS

From Seed

Sufficient seed is required to raise 80 plants of each stock sent for trial.

Alyssum, annual.

Aster, annual varieties for sowing in the open ground.

Pansy, winter-flowering (*hyemalis*) varieties only.

Phlox drummondii.

From Plants

Fuchsia, hardy (3 plants of each variety).
Helenium (3 plants of each variety).
Heliopsis (3 plants of each variety).
Pelargonium, zonal varieties for bedding (6 plants of each variety).
Phlox, alpine (5 plants of each variety).

VEGETABLES

In the Open Ground

Broad Bean (1 pint of seed of each variety).
Cauliflower, early varieties normally sown in January, to be sown at the end of May and to mature in the autumn, excluding 'Alpha', 'Erfurter' and 'Snowball' types (½ ounce of seed of each variety).
Celery, excluding self-blanching varieties (¼ ounce of seed of each variety).
Leek (½ ounce of seed of each variety).
Lettuce, cabbage varieties, excluding forcing, 'May King' and 'May Queen' types, for final transplanting in the open ground (½ ounce of seed of each variety).

Under Dutch Lights and Frames

Dwarf French Bean, flat-podded varieties, excluding pencil-podded types (½ pint of seed of each variety).
Early Carrot, varieties of the 'Amsterdam Forcing' type only (½ ounce of seed of each variety).

Conditions for entry to the Trials

1. All entries must be made on the appropriate form obtainable from The Director, The Royal Horticultural Society's Gardens, Wisley, Ripley, Woking, Surrey. One form should be completed for each entry and entrants are asked to state the number of forms required when making application for entry forms.

2. When the form relates to a plant normally propagated from seed the entrant must certify on the form either:

(*a*) that the variety or strain has been raised or developed by him

or (*b*) that the variety or strain was, or is about to be, introduced by him to British commerce.

The entrant must also supply sufficient particulars of the history of the variety or strain to substantiate his certificate, but such particulars will not be published by the Society without the sender's consent.

3. Entry forms must be completed and returned to Wisley not later than December 31, 1959. Entries received after that date cannot be considered for inclusion in the trials.

4. Plants and seeds *should not be sent* until the entrant receives notification that his entry has been accepted.

5. In the event of too many entries being submitted for a particular trial the Council of The Royal Horticultural Society reserves the right to scale down the number of entries received.

Calendar of Invited Trials

1960	1961	1962
	Flowers	
Alyssum, annual	Celosia	Antirrhinum
Aster, annual	Dianthus, annual	East Lothian stock
Bellis perennis	Fuchsia, hardy, from plants	*Lupinus polyphyllus*
Cornflower	Helenium, from plants	Pansy, excluding winter-flowering
Kniphofia, from plants	Heliopsis, from plants	Penstemon, from plants
Pelargonium, from plants	Nemesia	*Scabiosa caucasica*, from plants
Phlox drummondii	Pansy, winter-flowering	Wallflower
	Phlox, alpine, from plants	
	Rudbeckia, annual	
	Saintpaulia, from plants	
	Vegetables	
Broad bean	Cabbage, winter	Parsnip
Broccoli	Dwarf French bean, excluding pencil-podded	Savoy cabbage
Cabbage, maturing in spring	Kohl rabi	Spinach, spring sown
Cauliflower, early varieties sown in May	Lettuce, for trans-planting in the open	Spinach, late summer sown
Celery, excluding self-blanching	Parsley	Vegetable marrow
Leek	Sweet corn	
Under Dutch Lights and Frames		
Dwarf French bean, flat-podded		Summer cabbage, first early varieties, sown at the end of January for trans-planting in the open
Early carrot		

NOTE.—The years refer to those in which the trials will be judged. The calendar for 1961 and 1962 is provisional and may be altered at a later date.

THE PRUNING AND STAKING OF SHRUB-ROSES

V. Sackville-West, C.H.

IT was with considerable diffidence that I acceded to the Editor's request for an article on this controversial subject. I have never yet met one grower of shrub roses that agreed with another. Some are all for the wild careless rapture of air-borne branches which, in practice, lie only too often in mud-spattered strands along the ground; others favour a post-and-rail treatment, with only one rail, the top one, so that the roses, lightly tied forward, may like the Blessed Damozel look out —not at all a bad system for the tall loose-growing kinds such as the mossy 'William Lobb' who will go up to 10 feet if you let him, or 'Mme. Isaac Perèire' or 'Kazanlik', but I think it is a system to be adopted only if you have several bushes of the same variety or anyway of the same habit, planted in a row, say along a path; it is not suitable for a solitary bush. And in any case one should be careful not to have a parallel path allowing people to walk behind them, for the effect would distressingly recall a peacock's tail.

Others adopt the "pulpit" design, which consists of three tall stakes secured by wooden slats nailed high up around them. The rose grows up in the middle, and is allowed to pour laxly over the slats. This, to my thinking, is an excellent idea; it leaves the rose scope for natural development, and saves all the labour involved by tying-in. All that is needed is a judicious shortening of over-exuberant shoots.

Other growers, again, take the shears ruthlessly and trim their bushes down to a neat bun 3 or 4 feet high, between January and March. This method seems to me entirely contrary to the intentions of the rose, though from a practical point of view it may be necessary where the limitations of space are a consideration. (An exception should be made for some of the stockier, woody roses, massed together in a bed or grown as a hedge; an admirable example may be seen in the long double hedge of Rosa mundi, *R. gallica versicolor*, at Kiftsgate, MRS. MUIR's garden in Gloucestershire.) We have frankly followed MRS. MUIR's example here, by clipping down to a height of 3 feet a long rectangular bed of an old Gallica we found rampant on its own roots, obviously a Gallica but unidentifiable by name. It has been suggested that it might be 'Rose des Maures', but in default of a more authenticated attribution it now goes in the catalogues of the two nurserymen to whom I gave it as *R. gallica* 'Sissinghurst Castle'. I cannot claim for it that it is a very exciting little rose, but it was fun to have found it growing in our once derelict garden. Clipping it down means that it grows rather more sturdily, and that one can look down into the wealth of purplish-red upturned faces.

It would seem therefore as though each grower must follow his own instinct, subject to conditions of space and planting in his own garden, which means that it is possible only to offer the suggestions born of one's own experience without attempting to lay down any hard-and-fast rule. This, in fact, is what the Editor has asked me to do: to supply a few notes on how we treat our modest collection of shrub roses at Sissinghurst Castle.

By shrub roses it must here be understood that I mean anything from the so-called "old" roses, to more recent developments such as the hybrid musks. The one common denominator should be the character which, as MR. GRAHAM THOMAS rightly insists, leads us to regard them as "flowering shrubs rather than as roses in our modern conception."

In the first place, we are not cramped for room, having given up a fairly large area to their cultivation. This area is walled on two sides by high brick walls (15 to 20 feet high), covered by fig-trees, vines, and some of the tenderer climbing roses such as the yellow Banksia and *R. anemonoides* (*sinica anemone*). The other two sides afford the protection of hedges, yew, holly, and hornbeam. Paths, edged either by box or June-flowering irises, intersect the beds, which are spacious and somewhat jungly. This jungly effect certainly makes for luxuriance in mid-June, but it has its drawbacks and I have often wished we had not crammed the roses so close and had left more space between them, with stepping stones, for, as it is, the innermost ones are difficult and prickly of access. Ignorant amateurish impatience is to blame. One can hope only that others may profit by one's own mistakes.

The roses in this central massif are all grown on one principle. Three, four, or five strong wooden stakes according to need are driven into the ground around each bush, and the long shoots are then trained down and round the stakes, forming a kind of cage or lattice which in summer becomes a solid mass of bloom. This is an autumn and winter job, and it takes a very long time. The ends of the stakes should be charred, to preserve them; they should never be tarred, but Cuprinol or Paris Green is a safe and harmless preservative. I suppose one could have metal stakes, painted an inoffensive dark green; they would be expensive to start with, and you could not saw them off to the varying required heights, but they would at least be permanent.

Pruning is reduced to a minimum, for only unmanageably long top shoots have to be shortened and an excess of twiggy growth removed. Of one thing, however, I am now certain: that no growth should be allowed to develop into a tough old trunk, but should be cut away down to the root, before it can harden into old wood, and only the younger growth retained. Sometimes, if a hoary veteran has by chance been overlooked, a green young shoot may be observed springing out of it half-way up; in this case the cutting back should, of course, be done just above the join.

It would be tedious to give a complete list of the roses we grow in

this rather laborious way, but here are some of them: 'Tour de Malakov', 'Könegin von Danemarck', 'Cardinal Richelieu', 'Kazanlik', 'Chapeau de Napoléon', 'Mme. Hardy', 'Commandant Beaurepaire', *gallica complicata* (Fig. 137), 'Souvenir de la Malmaison', 'Coupe d'Hébé', 'William Lobb', 'Zigeuner Knabe', 'Gloire de Guilan', 'Roseraie de l'Hay', 'Variegata di Bologna', *alba maxima*, and even *gallica* 'Tuscany' which is not supposed to attain more than 4 feet but which in our garden has shot up to 6–7. I think that, like the *gallica versicolor*, Rosa mundi, it would be the better for shortening.

I believe very much in dead-heading the spent flowers, if it is at all possible to spare the time when so much else has to be attended to. It is a pleasant occupation for a summer evening, and sometimes a kind friend can be impressed into service. No good hoping that this task will induce many of the "old" roses to produce a second floraison, for the charge usually brought against them is only too true: that they expend themselves in one solitary burst, throughout June, and then shut up shop for the rest of the summer. This criticism does not apply to the hybrid musks, which are practically continuous right into the autumn, and repay dead-heading back to a new bud a hundred per cent.

For the hybrid perpetuals we have reverted to an old idea, and tie them down along curved "benders" of some supple wood such as hazel, poked into the ground at either end. Of course this involves keeping them in separate beds: you could not combine them with the taller, upright bushes. 'Frau Karl Druschki', 'Mrs. John Laing', 'Ulrich Brunner', 'Reine des Violettes', 'Souvenir du Dr. Jamain', and the Dicksons Hugh and George, all lend themselves very amiably to this treatment. The drawback is that the bed is ticklish to weed; you need to be as delicate-footed as a cat to step in and out between the hooped benders. Furthermore, a second tying-down becomes necessary later in the season, for fresh growth will shoot upwards and, unless controlled, may soon be waving about, loose and liable to snap off in a wind, to a height of 6 feet and more. On the other hand, the H.P.'s give their reward by flowering continuously for months on end.

I might here note that we have kept the purple roses more or less in a bed to themselves. This is not because some people fail to appreciate them—"Dingy things, not like a rose at all; one expects a rose to be red or pink or yellow or even white; no, that's not what I call a rose." Let us admit that the purple rose may be an acquired taste, and by purple rose I do not mean a red rose which "dies" badly, anathema to all rosarians (the H.P. 'Souvenir du Dr. Jamain', fast of its scent but unrivalled for putting your nose into, is a great offender in this respect). I mean the truly intentional purple, whether it be the slaty-lilac of 'Cardinal Richelieu', or the Parma-violet 'Tour de Malakov', or 'Charles de Mills', or 'Belle de Crécy', or 'Reine des Violettes', or 'Hippolyte' which by the way does much better in semi-shade, and the moss 'William Lobb'. These, and others, we have assembled in a corner, with an

underplanting of dark-mauve pansies, *Cheiranthus mutabilis*, and *Allium cyaneum*, and the old *R.* 'Veilchenblau' climbing the wall behind them. If people don't like them, they can turn their backs and look at something else, but I think the loss is theirs.

Some of the rugosa roses, stiff and self-supporting, may be grown as bushes without stakes. This applies to *rugosa alba*, which, with *R. moschata* and its hybrids, is perhaps the best for scenting the air for yards around. This observation should not be taken as in any way derogatory to the general atmosphere of scent exuded by a mixed collection. Heady and heavy, yet never cloying, an enclosed garden such as our walled garden is worth sitting in on a June evening.

Apart from the walled garden, we grow some roses up trees. This seems such an obvious and well-tried way of using climbing roses that I am always surprised when people exclaim. It is true that a short avenue of moribund almond-trees smothered in the white lace of *R. filipes*, SIR FREDERICK STERN's 'Wedding Day', and the old 'Garland', does provide a somewhat startling sight when you first come on it through an archway, and the vast skirts of 'Madame Plantier' encircling some old pear trunks are likewise effective. 'Madame Plantier' is perhaps not very well adapted, not being a rambler; she has to be propped up round a tripod of stakes secured to the tree, but the noisette scent alone justifies the trouble. The true ramblers are more suitable: 'Félicite et Perpétue' have clambered their way to the top of a high old pear tree; 'Adelaide d'Orléans' with exceptionally beautiful dark green foliage tipped with red climbs round an old apple; 'Léontine Gervais' dangles gracefully. We ought to have planted *R. moschata floribunda* up another tree, but never did. A strange omission.

I might add in conclusion that the soil here is nothing exceptional. It is neither light nor very heavy. Its pH content is roughly pH 7. I find that our roses usually exceed the heights prescribed in catalogues, but that may be because we command a luscious supply of pig-manure, put down in autumn.

THE LILY CONFERENCE

July 7 *to July* 11, 1959

THIS was the first Lily Conference to be held since 1933 and showed well the great enthusiasm that exists for the genus, while the beautiful co-operative exhibit in the hall of lilies from members of the Lily Group displayed the success that is being gained in the cultivation of a wide range of species and hybrids. Only a brief report is given here, since a full report of the Conference and all the papers given at it will appear

in the next issue of the *Lily Year Book* which will be published in the autumn.

The Conference was opened by the President, the HON. SIR DAVID BOWES LYON, K.C.V.O., V.M.H., who welcomed the members and, in particular, the delegates from overseas. He referred in appreciative terms to the work which SIR FREDERICK STERN had done for the Lily Group over many years and in organizing this Conference. He also thanked all members who had contributed to the Co-operative exhibit and drew attention to two large lily publications which the Society has well advanced, namely the new part of the Supplement to *Elwes' Monograph of the Genus Lilium* and the *International Lily Register*.

MR. LANNING ROPER then gave us a most interesting survey entitled "Lilies in England". He described in particular some of the lilies which have spread and become naturalized in English gardens such as *L. martagon* at St. John's College, Cambridge, and in other gardens, *L. hansonii*, *L. candidum* in some gardens such as that of the COUNTESS OF MUNSTER at Bampton in Oxfordshire, *L. henryi*, *L. pyrenaicum*, *L. regale* and *L. monadelphum*. He showed slides of a particularly fine group of several hundreds of *L. monadelphum* at Falkbourne Hall, near Witham, Essex, where they have naturalized under some giant plane trees over a fifty-year period. Of the N. American lilies *L. pardalinum* had proved the easiest and also the Bellingham hybrids which are so particularly vigorous on Battleston Hill at Wisley and in the Savill Gardens in Windsor Great Park. He also discussed a number of the rarer species and showed where they are being grown. MR. ROPER showed with an excellent exhibition of slides that the cultivation of this beautiful genus and the appreciation of it had reached a high water mark in England today. MR. E. B. ANDERSON in the discussion following this paper referred to the desirability of feeding lilies and also the necessity for good drainage. He also spoke of the widespread belief that some lilies such as *L. tigrinum*, 'T. A. Havemeyer' and the form of *tigrinum flaviflorum*, known as 'A. M. Vollmer', were virus carriers, and questioned the desirability of admitting these lilies to the garden where other lilies are grown, and other speakers later discussed this point.

In the next paper MR. E. E. KEMP, the Curator of the Royal Botanic Garden, Edinburgh, told us about lilies in Scottish Gardens and it was very encouraging to learn how many of the newer Asiatic species are being cultivated successfully there. *L. mackliniae*, for instance, has settled down in a number of gardens and can be regarded as likely to become permanent. In general it appeared that lilies in Scottish gardens are by no means less successful than those in English gardens and a slightly different variety of lilies is achieved. A number of the gardens have already been described in recent years in the *Lily Year Book*.

MR. H. J. VOORS, the Secretary of the Dutch Royal General Bulb Growers' Society, then told us about lily growing in Holland and emphasized particularly the efforts that are being made to obtain and to maintain virus-free stocks. He mentioned a number of new varieties

of *L.* × *hollandicum* raised in Holland whose flowering time was already past, but which should be valuable for the gardener.

At the Lily Dinner in the evening (July 7) there was a large attendance, and SIR FREDERICK STERN presented the Lyttel Lily Cup to DR. S. L. EMSWELLER of the Beltsville Research Station, Maryland, for his recent work with lilies, and the PRESIDENT presented the Peter Barr Memorial Cup for work on Daffodils to MR. H. J. VOORS. After dinner everyone went upstairs to see again the lilies in the hall, which looked particularly beautiful by electric light. The big Co-operative group from members of the Lily Group had been arranged most beautifully with supporting foliage by MR. T. H. FINDLAY and was agreed to surpass all previous efforts (Fig. 124). Unfortunately all the flowers of the majestic white *Cardiocrinum giganteum* were over for the year but the back of the group was well filled with 6 to 8-foot stems of *L. superbum*, the Bellingham hybrids, *L. henryi*, and other lilies in the orange and crimson range of colours.

An F.C.C. was given to the magnificent head of 'Limelight' (Fig. 125), a trumpet lily of beautiful proportion and unusually beautiful soft but deep lemon-yellow colouring flushed lime-green outside raised at the Oregon Bulb Farms and shown by the Crown Estate Commissioners, Windsor. It was an outstanding exhibit. A number of other American-raised lilies were shown—including African Queen, Royal Gold and 'Black Dragon' a very large trumpet lily of beautiful proportions with white flowers flushed green at the base and chocolate outside, as well as masses of the tangerine-orange 'Enchantment'.

From MAJOR and MRS. KNOX FINLAY of Keillour Castle, Perthshire, came several rare lilies, including a fine spike of *L. henrici* and an unusual *Notholirion* grown from seed collected in the wild and thought to be possibly a natural hybrid of *N. campanulatum* × *N. hyacinthinum*. Very large spikes of *L. szovitsianum* from the same gardens showed the long range of flowering season of this lily in different parts of the country. These were clear yellow, almost unspotted and had orange pollen.

From the same garden came also a very interesting range of seedlings of *L. martagon* with brighter crimson-red and pink colours than we had seen previously. 'Glisten' (shown under the name 'Glow') was a deep waxy cerise-pink, while 'Blush' was brighter but not so deep in colour and 'Gleam' (shown under the name 'Flush') was a paler pink. When considered with the slide shown by MR. ROPER of pink seedlings of *L. martagon* with flat starfish-like flowers growing in MR. WYATT's garden at Maidwell Hall, it shows how rewarding and how variable can be the result of raising seedlings from species and their varieties.

MR. O. E. P. WYATT brought from Maidwell Hall a selection of his beautiful golden-yellow hybrids raised from *L. parryi* and outstanding among these were 'Bridesmaid' and 'Sir Lancelot'. He also showed the rare Western American species *L. rubescens* with white waxy, upright starlike flowers changing to pink and then crimson as they age and

L. pitkinense, a very rare plant known only from the stock in one marsh and bearing rather small orange-red Turk's-cap flowers. As usual the Crown Commissioners, Windsor, made a great contribution to the group from the gardens in Windsor Great Park. The enormous white trumpets of the triploid 'Formabel' and the tetraploid 'Tetrabel' were particularly striking, while the gigantic spikes of the dark unspotted *L. martagon cattaniae* were some of the finest that have been shown in recent years.

COL. J. LESLIE from Norfolk sent lovely spikes of Royal Gold, that interesting deep yellow mutant of *L. regale*; MR. R. J. PLATT showed from the Sissinghurst Castle Gardens *L. nepalense* and *L. lankongense*, while lilies from the late MR. WALTER BENTLEY's old garden at Quarry Wood were well shown by MRS. SIMMONS and included the uncommon *L. occidentale*. In all there were 150 vases of lilies sent by twenty-two exhibitors and containing thirty-five different species and forms of species of lily and thirty-six hybrids.

MR. JAN DE GRAAFF sent from his Oregon Bulb Farm some superb spikes of the hybrid lilies raised there in recent years and also unusually strong spikes of such species as *L. lankongense*, *L. cernuum* and *L. taliense*. His Pink Perfection group raised from *L. leucanthum* var. *centifolium* is certainly the deepest and largest trumpet lily in this colour and the spikes each carried twelve or more flowers. His 'Green Dragon' is a lily of great beauty, not unlike a larger trumpet *L. brownii*.

MR. A. M. BEST, M.P., brought over from Canada a group of Canadian-raised hybrids and several of these were shown also on the dais. Those raised from *L. cernuum* attracted particular attention and his 'Primrose Lady' with drooping cream flowers, 'Chimes' with deeper lemon-yellow flowers and also 'White Princess' were well worth noting.

MR. G. W. DARBY of Rabley Heath, Welwyn, Herts., showed a large exhibit in the centre of the hall of seedling lilies which he had raised. These showed great variation and many were of particular interest and beauty. Many of them were flowering well although only 15 months from seed after being grown in a cool greenhouse.

Messrs. Wallace and Barr had a good group including a number of the newer American and Canadian raised hybrids as well as unusually fine vases of *L. brownii*. A number of paintings were shown along one side of the hall and REAR-ADMIRAL PAUL FURSE showed 160 paintings of species and forms of *Fritillaria*, which is probably the largest collection ever shown in the hall of paintings of this genus. They included many very rare and unusual species and forms. The beautiful drawings by MISS MARGARET STONES of lilies for the new part of the *Elwes' Supplement* and a series of very fine paintings of lilies by NIGEL WYKES were also shown. These latter included very detailed drawings of the flowers of a series of the newer hybrids of *L. auratum* × *speciosum* raised by DR. J. S. YEATES in New Zealand.

On the next morning (July 8) DR. S. L. EMSWELLER of the Beltsville Research Station at Maryland, U.S.A., gave us a particularly interesting survey of lily research in America and in his answers to the questions

elaborated on other points, revealing a vast fund of knowledge on lilies ranging from breeding to diseases, feeding and specification. Of particular note was his account of the chromosome factors in the breeding and progeny of the tetraploid lilies he has raised and investigated. His physiological experiments had shown that lilies took up large amounts of nitrogen while they were growing but as soon as they came into flower they ceased to require much nitrogen but took up a much increased amount of potash, presumably to build up the bulbs. This observation ought to be a help to all lily growers.

MR. K. WADA of Japan then showed a number of very fine coloured slides of lilies growing in the wild in Japan. As well as *L. auratum* and *L. speciosum* they included several species very little known in this country. Of great interest was the newly described *L. bukosanense* and also the two white lilies *L. nobilissimum* and *L. alexandrae* which he regards as quite specifically distinct and which also have different areas of distribution. His pictures showed something also of the hazards of lily collecting in Japan, the rough seas to be crossed to little-visited islands and the high cliffs only to be descended to the lilies on their ledges with the aid of ropes.

Summaries of the papers on Lilies in Australia by MR. G. ERREY and on Lilies in New Zealand by DR. B. W. DOAK were read in their absence and slides were shown of lilies from New Zealand. The papers will be printed in full in the special Conference Number of the *Lily Year Book*. MR. ERREY told us that out of three million square miles in Australia only a small area was suitable for lily growing and the best areas were between 500 feet and 3,000 feet above sea level and south of the latitude 33° S., i.e. that of Sydney. The first show of the Australian Lilium Society had been held in February and had aroused great interest.

In New Zealand there has obviously been very great success in lily growing in recent years, particularly in the forms and hybrids of *L. auratum* and *L. speciosum* and great variety has appeared among the gigantic number raised from seed. In New Zealand selected clones of this group are propagated by scaling in the open ground at or immediately after flowering time.

During the afternoon members visited the Royal Botanic Gardens, Kew, and were able to see many lilies growing and flowering well although in the very hot weather of the previous few days they had tended to go over quickly. DR. GEORGE TAYLOR, the Director, was, however, able to show the party several rarely seen species in flower such as *L. grayi* and *L. parryi* var. *kessleri*, while *L. maritimum* was only just over. A special exhibition in the Herbarium of lily and fritillary paintings, preserved bulbs, seeds and capsules had also been arranged.

On Thursday morning (July 9) the members visited the R.H.S. Gardens at Wisley and were able to see the big colonies of Bellingham hybrids on Battleston Hill, as well as numbers of the brightly coloured 'Enchantment' in the borders near the foot of the hill and many others. The outstanding lily in the garden then, however, was *L. canadense*

rubrum, which had two magnificent spikes 6 feet high among the rhododendrons of the species collection.

In the afternoon symposia on *Fritillaria* and *Nomocharis* were held in the lecture room at Wisley and were very well attended. In a very thorough introductory paper REAR-ADMIRAL PAUL FURSE gave an account of progress in *Fritillaria* since the last Conference and added a very strong plea for more wild collected material, especially that accompanied by good collecting notes on its source and habitat. This plea was reinforced by DR. W. B. TURRILL from the Chair. The following discussion showed clearly the healthy interest in the genus.

MAJOR KNOX FINLAY opened a spirited discussion on *Nomocharis* and his slides showed how outstandingly successful he is with this genus. Unfortunately no one else was able to come forward with anything like a comparable success. It appeared from his paper that probably all the plants in cultivation now are hybrids and a further collecting in the wild of the true species would be very beneficial (Fig. 119).

On Friday (July 10) the members visited the Great Park at Windsor and in the morning listened to papers on lily hybrids in Canada, U.S.A. and in this country given in the York Hall.

After the papers, the curtains of the stage rolled back to reveal the largest and most magnificent vase of *Lilium* 'Shuksan' that most of us have ever seen. In view of the speakers to follow, MR. WYATT gave us only a modest curtain raiser and showed a few slides of his hybrids. MR. ALEXANDER BEST, M.P., then spoke on Lilies in Canada and showed us a magnificent collection of coloured slides, both of the newer hybrids raised there and of the species native to Eastern N. America. His deep scarlet *L. grayi* was very impressive as were also his two slides of the yellow and red varieties of the graceful *L. canadense*. He showed what a great deal of work is being done raising lilies in Canada. Particularly successful are the hybrids from *L. cernuum*, *L. tigrinum* and *L. davidi* var. *willmottiae*, raised by DR. C. F. PATTERSON at the University of Saskatchewan and a number of these could be seen in the hall. They have introduced into Turk's-cap lilies long rather pendulous curving pedicels and pink, lemon and cream-coloured flowers.

MR. JAN DE GRAAFF of the Oregon Bulb Farms then spoke of his more commercial approach to lily hybridizing and his field of lilies gave us a small sight of the vast scale on which he is working. Many of his newer hybrids were also on view in the Show and his pictures were no less impressive.

In the afternoon the party walked round the Savill Gardens and thoroughly enjoyed the many beautiful plants there and especially the lilies growing so well in such perfect settings. 'Shuksan' was particularly impressive and so were the tall stems of 'Limelight', African Queen and other American-raised lilies, while a group of seedlings of *L. canadense* in a very varying range of colours aroused admiration.

The following day (July 11) a large group of members went to MR. OLIVER WYATT's garden at Maidwell Hall, near Northampton, and

again saw a large number of beautiful lilies in a setting of unusual trees and shrubs. A recently raised American hybrid of *L. bolanderi* × *L. pardalinum* was in flower and surprised the party with its curious magenta-coloured flowers, which were darkest at the tips and had a few spots in the centre. It stood 3 feet high and had about fifteen recurved and pendant flowers. He also showed a very fine group of *L. brownii*, the tallest stem of which had four flowers. The number of Western American lilies growing well beside the large plantings of MR. WYATT's own hybrids were considered as one of the high features of the Conference.

After tea the party broke up and the Conference really came to an end but there can be little doubt among those who attended the meetings that it had been thoroughly enjoyed and many new and valuable friendships and contacts had been established which should help to establish lily growing on an even wider basis as well as giving a multitude of new ideas, information and experiences to all who attended.

MIXED BORDERS

Christopher Lloyd

THERE is nothing new about mixing plants of different habits in one border. Indeed, most gardeners are doing it, though they may still be calling the result a herbaceous border. But it has ceased to be this. The herbaceous border in its pure form comprises hardy herbaceous plants alone. It can be most effective, but these rather stringent rules impose quite unnecessary limitations. Gardeners rightly feel that, if the result seems good, they should be able to juxtapose any sort of plants they like. Yet (such is the mystique of the pukka herbaceous border) they still feel a bit guilty about doing this.

At Wisley—for this seems an appropriate place to speak of our Society's gardens—the two permanent flower borders had long been devoted, respectively, to annuals and to hardy herbaceous perennials. Now there has been added a double mixed border of hardy herbaceous plants and shrubs. But I should like to see this border go the whole hog and really mix it. Perhaps, as a start, the formal bedding-out plots might be done away with, and groups of their more worthy contents used in the mixed border. Cannas, for instance, at present degraded as dot plants, would make a handsome contribution if informally and generously grouped.

I find it hard to conceive how the rigid concept of a herbaceous border ever came to be. Its only advantages, as I see it, are that the whole border can be drastically overhauled throughout its length and breadth at periodic intervals; also, that it can be practised fairly successfully with the minimum of imagination.

GERTRUDE JEKYLL is often cited as one of the great original exponents

of the herbaceous border. We have only to go back to her books—and how thoroughly worth while are repeated readings of *Colour in the Flower Garden* and *Wood and Garden*—to see how wrong we were. Sixty years ago she was writing: "I have a large 'mixed border of hardy flowers'. It is not quite so hopelessly mixed as one generally sees, and the flowers are not all hardy. . . ." In it she grew such disparate plants as yuccas and gladioli, African marigolds and lilies (plunged in their pots at a crucial moment), sunflowers and golden privet, dahlias, grasses, hydrangeas, hollyhocks and the whole normal run of hardy herbaceous material. The excellent photographs of this border bear witness to the fine results she achieved. They seem as appropriate now as then, and have not dated in the least.

A little later she writes: "There is nothing much more difficult to do in outdoor gardening than to plant a mixed border well, and keep it in beauty throughout the summer." I agree with this, and not because I wish to flatter myself by making the craft I practise sound difficult. Clearly there is a danger that with so much plant material to choose from one may be tempted to grow a little of everything. The very word "mixed" seems to suggest a rash of multi-coloured spots. Self-discipline is all-important here and one should aim at broad effects, eschewing fussiness,

As to keeping "the border in beauty throughout the summer", MISS JEKYLL gives three months as the outside limit, while straining every nerve to achieve so much. July, August and September was her period. I strive for four months, including late June and early October, but probably have more dull patches through the season than she did, as a result.

The shorter the season aimed at, the easier in practice, and where narrow borders of 8 feet or less are in question, a shortish season of interest must be the rule, or the effect will be weak throughout. There is no scope for "passengers" in a narrow border.

The magic word "labour-saving", which guides all our gardening activities today, has not yet been discussed. Well, of course, it is possible to furnish a mixed border with labour-saving plants. There are plenty of evergreen shrubs which need the minimum of attention, while among herbaceous plants such things as day lilies, hostas, bergenias and paeonies are practically indestructible and will smother most weeds. Biennials, annuals, tender perennials and bulbs could be excluded altogether. In semi-woodland, all this might be well enough, but so improverished a choice is rather stultifying in the average garden, which is not of a woodland type.

I must confess to being weary of the parrot-cry that labour-saving has become. Far better, it seems to me, to garden intensively as big an area as you have the time and inclination to cultivate and save your labour on the rest—grass it down, if you like, or cover it with quick-growing rhododendron hybrids. I shall assume that the gardener I have in mind is going to take pains with his mixed border.

One large border will be very much easier to manage effectively over a long period than two or three small ones, so the larger the better, within reason. Shape will be dictated by the site and personal preference. Curved outlines and an island site have the advantage that the border can be seen from a great many viewpoints, parts in perspective and other parts broadside on. Good planting in these circumstances is at an even higher premium than usual. However, one must not expect to get everything right at the start; the chances are, where the gardener has a critical eye, that three years from an original planting, scarcely anything will remain where it started! One advantage in a straight border is that, since it will always be viewed more or less end-on, the perspective of shrubs in it will compose a pleasing landscape at midwinter while entirely concealing the earthy gaps left by herbaceous and ephemeral plants.

Before making any plans at all, one must be clear in one's mind what season the border is required to cover. Personally, I think that late summer and autumn is the most satisfactory period, as one can then build up to a climax over many months with a sudden collapse in a matter of days during October, rather than build rapidly up to a climax in early summer and then suffer a slow decline of three months thereafter. Too many gardens go to pieces soon after midsummer, just when the countryside itself is looking its heaviest and most tarnished, so that the contrast of gay flower borders is the more welcome. But then if you leave your home for six or eight weeks each August and September an earlier season for the border is obviously necessary.

Now to consider the materials with which to furnish it—though I should, perhaps, first of all stress the value of thorough preliminary preparations of the ground. As the site will never be empty again, this is your great opportunity for working it well and doing it proud with bulky organic manure. If ground elder or couch grass or *Equisetum* (horse tail) is present in quantity, it may be worth delaying your planting for a year so as to apply sodium chlorate—at the height of the growing season. A border in which perennial weeds are not under control is quickly ruined.

The foremost requirement of whatever you may plant is that it should have a long season of interest—be it of flowers or foliage. (Handsome foliage is every bit as interesting to look at as bright flowers.) A really large border can include a certain number of plants with a short season, and it may still be possible to disguise or remove these when their day is past. Where tall plants of 6 feet or over are required, shrubs will generally serve better than herbaceous plants, for tall species of the latter are mostly coarse and ungainly.

The most useful shrubs in a mixed border tend to fall into one of two categories. There are the backbone-forming kinds, usually evergreen, and the flimsies—the sort of shrub which flowers in late summer or autumn on young wood and is nearest akin to herbaceous plants.

Backbone shrubs give firmness of texture to the border, at all seasons.

It is they, supremely, that make of a mixed border's contours an outline that is so much more satisfying, in its purposeful bumpiness, than anything which a herbaceous border can hope to realize. It will be necessary to guard these shrubs in their youth from being swamped by the annual growths of lush neighbours. At the same time it is wise to choose fairly fast growing species.

Yuccas have great building value and make excellent full stops. So does *Euphorbia wulfenii* (Fig. 127), with columns of glaucous foliage that are projected into the pale green cylinders of flowers for eight weeks in the year. *Cistus* is a fine genus for our purpose. I am especially fond of the compact habit and neat foliage of *C. corbariensis*. *Choisya ternata* and *Fatsia japonica* are first-rate backgound plants if an evergreen hedge is lacking. Both have warm, bay-green leaves. Then there are the mahonias, handsome in foliage at every season. Hebes have strong personalities and are very quick growing: 'Autumn Glory' will thrive even in cold Midland gardens and is ideal at the border's front margin, spilling over and concealing hard lines. Do not worry if it kills out a bit of lawn; it is worth it. If, after a number of years, the plants straggle, they and all their brethren will stand being pruned hard back in spring, with perfect good humour. Another virtue in these shrubby veronicas is that they flower over a tremendously long season from midsummer onwards. All are not very hardy, alas. 'Midsummer Beauty' is pretty fairly so and has the longest, slenderest spikes of any, in lilac shading, scented. 'Evelyn', one of the large-flowered hybrids, has telling glossy foliage, purple tinged, and rich purple, truncated flower spikes. It makes an upright 3 foot bush and wants grouping, five or six together with something pale and airy close at hand, like *Viola cornuta alba*, which will weave among its leggy stems. 'Evelyn' and other similar cultivars are of doubtful hardiness but grow fast and propagate easily.

Of grey-leaved evergreens, *Senecio laxifolius* is a stand-by, and so very vigorous. If its rather blatant yellow daisies do not suit your colour harmonies, the bushes can be prevented from blooming by cutting them back annually in March. *Phlomis fruticosa* has nice yellowish grey foliage and dull-yellow flowers. I grow it behind *Hebe* 'Autumn Glory', and behind the phlomis is a plant of *Clematis* 'Lady Betty Balfour' and a group of double red *lactiflora* paeony hybrids. Her Ladyship grows up a chesnut pole till mid-July, when sage and paeony have both finished flowering, and is then brought down (the pole extracted) and trailed over them, producing its crop of large blossoms in September. The shrub with the palest grey foliage of all is *Senecio cineraria* 'White Diamond'. It is a plant for the front and again wants severe treatment in spring to obviate a crop of ragwort daisy-flowers later on. If these are prevented, many flowers will associate well with 'White Diamond', especially shades of lilac (e.g. *Hosta lancifolia*), blue (e.g. 'Love-in-a-Mist') and pink (penstemon cultivars). *Senecio leucostachys* is just as good in its way—rather more elegant and with white flowers which need no controlling, but it is unreliable

FIG. 119—Forms of Nomocharis close to *N. pardanthina* (left) and *N. mairei* (right) growing at Keillour Castle, Methven, Perthshire, from a painting by Margaret Stones reproduced by kind permission of the artist and of Major and Mrs. W. G. Knox Finlay

Photo: J. E. Downward

FIG. 120—*Magnolia campbellii* in April 1959

FIG. 121—*Magnolia kobus* var. *borealis*

Photo: J. E. Downward

FIG. 122—*Magnolia stellata*

Photos: J. E. Downward

FIG. 123—*Magnolia* × *soulangiana*, an old tree in the Royal Botanic Gardens, Kew

FIG. 124—Part of the co-operative exhibit from members of the Lily Group staged for the Lily Conference 7-8 July 1959

Photo: J. E. Downward

FIG. 125—Lilium 'Limelight'. F.C.C. 7 July 1959. This lily was raised at the Oregon Bulb Farms and shown by the Crown Estate Commissioners from Windsor Great Park

Photo: J. E. Downward

FIG. 126—Part of the Long Border at Great Dixter, Sussex, the home of Mr. C. Lloyd

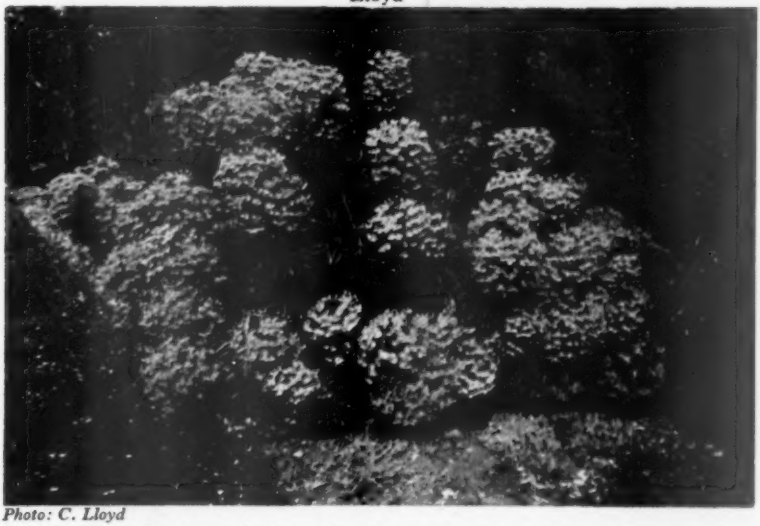

Photo: C. Lloyd

FIG. 127—*Euphorbia wulfenii*, a distinctive shrub for the Mixed Border, a fine specimen at Great Dixter

FIG. 128—Part of the Mixed Border at Great Dixter with sedum and anthemisia in foreground

Photos: J. E. Downward

FIG. 129—Shrubs, cannas and herbaceous plants in the same border.

FIG. 130—*Senecio laxifolius*, a fine grey leaved shrub with *Potentilla fruticosa* and thalictrums in a mixed border at Great Dixter

Photos: J. E. Downward

FIG. 131—Another border with Arctotis hybrids, fuchsias and *Galtonia candicans* in foreground

FIG. 132—Bullfinch eating apple blossom

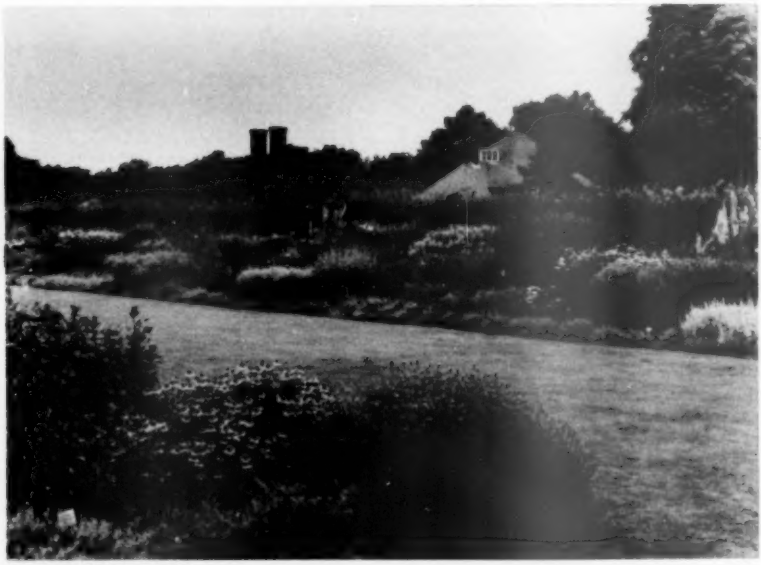

Photo: J. E. Downward

FIG. 133—Part of the new Mixed Borders leading up to Battleston Hill at the R.H.S. Gardens, Wisley

FIG. 134—Showing training and tying in of Shrub Roses, a photograph taken in spring at Sissinghurst Castle, Kent

Photo: J. E. Downward

FIG. 135—A specimen Shrub Rose coming into flower in June at Sissinghurst Castle, showing staking and tying in

Photo: J. E. Downward

FIG. 136—Rose 'Zigeuner Knabe' with *Allium albo-pilosum* in foreground

FIG. 137—*Rosa gallica complicata*

in winter. So is *Centaurea gymnocarpa*, with the most beautifully dissected grey foliage of all. I can usually make it do two years in the border, after which it subsides into a rotten mush. One can help to stop this happening by stripping off as many leaves as one dares from the old plants at the onset of winter.

Turning now to the summer-autumn flowering shrubs of flimsy structure and ultra-rapid growth: they are typified by *Buddleia davidii* in all its cultivars. The tree mallow, *Lavatera olbia rosea*, will flower for five months and grow six or more feet tall in a season. *Hypericum patulum* 'Hidcote' is generally an excellent contributor, with its succession of yellow saucers, but in my border I tend to lose the early crop, thanks to a species of tortrix caterpillar which binds itself into the terminal buds and proceeds to devour them at its leisure. This shrub goes well with the lavender spikes and silver foliage of *Buddleia fallowiana* 'Lochinch'. If you include *Caryopteris clandonensis* in your border, make a group of three or five plants at the front and beware of competition from neighbours. It cannot bear being shaded out. Capsids are often a great nuisance on all sorts of mixed border inmates, and particularly serious to the flowering of caryopteris. Sprays of D.D.T. emulsion at three-weekly intervals will control. Some effort is worth expending to get the long blue flower clusters on this shrub in early autumn. Plant some red fuchsias like 'Mrs. Popple' or 'Mme. Cornelissen' well behind it—even though the capsids may enjoy flitting from one to the other.

The misty combination of tiny grey leaves and tinier blue flowers in *Perovskia atriplicifolia* is given fibre and strength by a fastigiate habit. One might like to endorse this with associated groups of *Kniphofia nelsoni*, *Galtonia candicans* (with its unusual combination of spikes and bells) and the coral funnels of *Penstemon isophyllus*. Cut out the penstemon and the kniphofia, and one could substitute the warm pink-red of *Agastache mexicana* and the chilly bluish pink of *Physostegia virginiana* 'Vivid'. Actually I have chosen contrast for my perovskia by siting the deep scarlet moons of dahlia 'Vic' behind it.

A shrub of which I have high hopes for the back of my border—it has been there for only a year—is *Sambucus canadensis maxima*. I first saw this elder at Hampton Court. It bears enormous terminal corymbs of the typical creamy white flowers and can be savaged back to a stump annually, in winter, thus keeping it in order. Any rose that flowers on young shoots counts as a flimsy, but it must have a good constitution to cope with the hurly-burly of mixed border life, and not be subject to black spot. The soft pink hybrid musk 'Penelope' is ideal. I have two bushes, each 5–6 feet tall, of the old variety 'Perle d'Or' that seems to combine the attributes of H.T. and Floribunda—quite at home among cannas and acanthus. Of course, roses are unpleasantly detrimental to a border's winter aspect, but most of them can be pruned to harmless insignificance in autumn, without taking ill.

Hardy herbaceous plants suitable for a mixed border have already received some mention, but must now be brought into clearer focus. Little room should be spared those which flower for a fortnight only and can do nothing more for us, nor we for them. *Solidaster luteus*, for instance; it is a lemon foam of daisies for an August hour, but that is the beginning and the end of it. The old *Geranium ibericum* and *G. grandiflorum*, flowering in June, are different. As soon as their last petals have dropped the plants can be cut to the ground, and within a few days a new mound of handsome rounded leaves will have sprung up and will remain in pleasing trim till autumn. The white and purple dittany, *Dictamnus albus* and *D. albus* var. *purpureus*, have their winged seedpods as well as good foliage to justify them after June.

Delphiniums, too precious to be omitted, are yet a grave problem after mid-July. In a really large, one-sided border, the gap they leave at the back will not be evident if something tall and late is grown in front of it, like *Chrysanthemum uliginosum* or *Salvia uliginosa* (not really so bog-loving a duo as they sound). Or a late flowering clematis can again be worked in to cover the stumps; I use *C. flammula*. If you plant a clematis to prevailing windward of the plants it is required to cover, you will spare yourself the trouble of training it in the right direction. There is one superb giant among herbaceous plants—noble, not coarse. Happy the man who has space for the cardoon, *Cynarus cardunculus*. In May and June, at the 4–5 foot level, we have its grey-green, deeply fissured leaves, often compared with the acanthus, but infinitely superior. Through this stratum there soars to 9 feet an antlered structure crowned with spiky globes—artichoke-like but smaller and more numerous. These burst into cushions of blue-purple stamens in August and September, warm-scented and bee-inviting; mere humans cannot get near them and must content themselves with sniffing at wild thistles.

To invoke a different smell—a bold group of giant chives, *Allium schoenoprasum sibiricum*, is thoroughly effective at the front of the border. A batch grown from seed will be in many shades of pink and mauve, and the first (and best) flush blooms at the turn of May and June. After this one can act in either of two ways. If the plants are cut to the ground, they will grow and flower again, and yet a third time, given similar treatment, but not so freely. Alternatively, one can lift the clumps and line them out (near the kitchen) pending re-planting in autumn, filling the gap with a dwarf aster—'Rosebud' is my favourite—or with early-flowering 'Charm' chrysanthemums, themselves grown in readiness in a spare row (instead of tomatoes, which would anyway have been ruined by blight). A certain amount of switching around is a great aid to keeping mixed borders at the top of their form.

Most of the Michaelmas-flowering asters have a two-week season only, so one does not want them cluttering up border space for the whole summer. The medium-tall cultivars can be switched with perennials like *Campanula grandis* and *C. persicifolia*, which do not mind how

often they are moved and replanted; or can replace biennials such as Canterbury bells, foxgloves, sweet williams, anchusas and the related, sky-blue *Cynoglossum amabile*.

I have yet to meet the gardener who was not transported by the charms of Ligtu hybrid alstroemerias. Once established they are no trouble. If pot-grown seedlings are turned out bodily into their final positions some four months after a spring sowing, all will be well. Groups deserve careful supporting. In the second half of July, when flowering has ceased, the plants look a wreck. If all the stems are then pulled out, each will break cleanly away from the tubers at about 6 inches below the soil surface. The ground can be lightly forked over and something dropped in that can be planted without major excavations. You are sure to find a suitable filler if you look around! A few self-sown cosmea seedlings that have germinated late in another part of the garden, for instance. Last year I used two or three plants of the peppermint-scented *Pelargonium tomentosum*, and on another occasion, seedlings of *Salvia patens*.

Some of the very best hardy perennials are those which will flower a second time if conscientiously dead-headed. This is an important task and cannot be delayed or skimped. *Helenium* 'Moerheim Beauty', *Salvia superba*, and the cultivars of *Anthemis tinctoria* are all reliable second-bloomers.

Of tender perennials, many bedding plants can be fitted into the mixed border scheme—dahlias and cannas outstandingly. Dahlias never look better than in mixed company: emerging from a sea of Japanese anemones, rubbing cheeks with plumes of *Artemisia lactiflora*, or backed by a fountain of buddleia. It is a mistake to grow them in isolation; but they do need especially generous feeding in a mixed border. So do cannas; these, the flowers, shapeless but exotic as a bunch of silk handkerchiefs, are too much at the mercy of our British winds. But the foliage, whether bronze or green, compensates for disappointments in a rough summer.

The only biennial I must mention, besides those to which reference has already been obliquely made, is *Verbascum olympicum*, the tallest and most stately of all mulleins. It grows to seven or eight feet, and the main spike branches freely in a mighty candelabrum. Now the trouble with branch systems of this kind as one usually meets them—in delphiniums, for instance, and in aconitums like 'Bressingham Spire'—is that the effect is greatly weakened through the central spike having shed its petals by the time the side spikes are fully expanded. Not so with this or any other mullein; a succession of flowers opens along the entire length of every spike or spikelet for five or six weeks. *V. olympicum*'s efforts are exhausted by August Bank Holiday. I have planted a *Clematis jackmani superba* among mine, to weave among the dying skeletons. The more one uses clematis, the more uses one finds for them. From time to time an odd seedling of the mullein will appear in a place of its own choice. Such as these are often worth

leaving, even when their standard is raised at the very front of the border. They are happy accidents.

Annuals that will re-sow themselves year after year are some of the most helpful: love-in-a-mist, opium poppies, nasturtiums. Then, of course, near to any seat one will want a patch of mignonette or white nicotiana.

I hope that this résumé has given an inkling of the types of plants that may be worked into a mixed border and of how this may be done. It probably sounds complicated and very often is, but problems which seem intractable in print or when discussed, have a remarkable habit of sorting themselves out when confronted on the ground. All means are permissible, however complex or unlikely, so long as the end attained appears simple and unstrained.

MAGNOLIAS AT KEW

S. A. Pearce, F.Inst.P.A.

AMONGST the large and varied collection of trees and shrubs that embellish the Royal Botanic Gardens, Kew, magnolias hold an unrivalled and unique place and although they may be eclipsed by some other subjects, particularly rhododendrons, in variety and brilliance of flower, their nobility is unchallenged.

Most magnolias, particularly those that reach large proportions—and most of them do—have when in flower an irresistible appeal which attracts and commands attention from everyone. Undoubtedly the substance and poise of the blossoms together with their rich fragrance and luxuriance is responsible, but it is nevertheless something not shared by many of the permanent occupants of our gardens.

It is therefore not surprising that one of the frequent inquiries received at Kew during the early spring is "When will the magnolias be at their best?" It is also interesting to note that there are people who make only one or possibly two visits per year and then for the purpose of seeing their favourite magnolias. However one may view this more or less single yearly visit, it is evidence of the exalted beauty and charm possessed by magnolias.

Before dealing with individual species, varieties and hybrids, it may be wise to outline briefly the cultural requirements, because in common with most of our ornamental trees and shrubs, magnolias require generous treatment. Soil preparation should be the best possible and during the years following transplanting liberal feeding and mulching should be given. Generally speaking the ideal soil is a good medium loam with reasonable drainage. At Kew, the natural soil is too well drained, for being a light sandy loam overlying old river bed, there is no natural water-holding capacity and after even a week's dry weather,

it begins to dry out severely. It is necessary therefore to prepare thoroughly all planting sites for not only magnolias, but all trees and shrubs, by incorporating good loam mixed with leaf-soil and peat in order to provide suitable rooting conditions and also some retention of moisture. It is safe to say that it is due to this preparation of planting sites for magnolias at Kew, that we have today established specimens that compare quite favourably with those in other districts where soil and growing conditions are far in advance of those at Kew. We cannot of course boast of the large tree-like specimens of some species and varieties, such as occur in Cornwall and other parts of the West Country.

The transplanting and establishment of young magnolias is not always so easy as one is often led to believe. Almost without exception the rooting system is composed of thick fleshy roots that can be easily damaged. It is not surprising therefore that magnolias are rather touchy about being moved, even when quite small. Generally it is not good to disturb them, unless grown in pots or other receptacles, during the dormant season or resting period. The best time for planting is either during early autumn when the soil is still warm, or just as growth is commencing in spring. It is during these periods that the rooting system will quickly re-establish itself and there is less likelihood of roots that may have been damaged in transplanting, dying and decaying. At no time should the roots be exposed to the drying effects of sun or wind and if the plants are not in receptacles, the ball of roots should be kept covered with damp sacking or some other medium, until the actual planting can be carried out. If the soil is at all dry, it is well to water in the roots and then apply a light mulch of decayed manure or compost to prevent rapid drying out of the surface soil. Being surface rooters, magnolias must not be planted too deeply and for this reason care should be taken to prevent the sinking of the soil, especially at the bottom of the planting hole. If the soil is well firmed in the base, and a planting board placed across the centre of the hole, correct depth can be easily ascertained.

Given generous and careful preparation, and preferably a sheltered position, there should be no difficulty in establishing newly planted magnolias, but care must be taken to see that they do not suffer from lack of moisture during dry weather, especially during the first year following planting.

Most of the species, varieties and hybrids are hardy so far as growth is concerned, but the flowers of the earlier flowering kinds in particular are liable to be damaged by spring frosts. Actually they are no more susceptible than many of our other treasured subjects and in particular the rhododendron or camellia, which are equally susceptible to blossom damage.

It is not within the scope of this article to discuss in detail the propagation of magnolias and it is probably sufficient to say that it is carried out by seeds, which must be fresh. (They quickly lose their viability if stored for any length of time, especially under dry conditions.)

Quite a number of species and hybrids can be propagated vegetatively by means of cuttings or by layering, while the large tree-like species are frequently grafted. The more elaborate methods of propagation are best left to the nurseryman or other experts, but seeds when obtainable provide an interesting and fascinating hobby for anyone, and there is the sense of achievement in raising one's own young plants that is particularly satisfying.

The main purpose of these notes is to discuss the merits of the various species, varieties and hybrids grown in the collections at Kew, and also give figures regarding their height and span of branches, together with the location of the shrubs or trees. The accompanying illustrations have been reproduced from photographs taken this spring and they do show the beauty and wealth of bloom that is available to the visitor to Kew (Figs. 120–123).

Actually the main displays are contained in two separate plantings or collections, one situated near to the Victoria Gate, and the other adjacent to the Azalea Garden. In addition there are many isolated specimens or groups in different parts of the grounds, and all of them provide from March to June an unforgettable display that seems to go on year after year, no matter what the season may be. Of course the earlier flowering kinds may be damaged by frost or cold winds, but even so the later kinds usually more than make up for these early losses of blossom.

Taking the deciduous kinds first and in order of flowering, we find the "Starry Magnolia", *M. stellata* from Japan, well represented with several groups and isolated specimens. The oldest of these, now well over 50 years, is near to the Ferneries and not far from the Main Gate, there being several bushes growing in company with one another to provide a dense mass quite 12 feet high and 16 feet wide. Near No. 4 House there is a corner bed filled with a number of younger bushes that flower freely. Close to Victoria Gate and near to the Azalea Garden other individual specimens make a charming display provided weather conditions are kind and do not damage the profusion of small white fragrant flowers with strap-shaped petals that each have a faint flush of rosy-lilac at the base. There are also a number of bushes of the rosy-lilac coloured variety, *M. stellata* var. *rosea*. This form is exceedingly pretty when the flowers begin to open, but the colour fades and the early promise is not fulfilled as the blossoms mature and to me the result is always disappointing.

Allied to *M. stellata* and also a native of Japan is *M. salicifolia*. It forms a slender tree and flowers before the willow-like leaves appear, and provided weather conditions are favourable the small white flowers composed of six narrow, broadly lance-shaped petals provide a pleasing spectacle, for they are freely produced. The only large specimen of this species in the gardens grows near the Azalea Garden. It came from the Yokohama Nursery, Japan, in 1906 and after 53 years has now reached a height of 37 feet and a girth of trunk of 2 feet 7 inches at 3 feet above

ground level. It is seen to advantage when in flower against a background of trees.

Nearby are several trees of *M. kobus* and its variety *borealis*, which at Kew flower freely during April most years. The largest of them is 37 feet high and with a branch span of over 40 feet and well over 50 years old. It is unfortunate that in some districts, notably Cornwall, large trees of this magnolia fail to flower with freedom and for this reason *M. salicifolia* is to be preferred for general planting because it does begin to flower when quite young. However, as seen at Kew, *M. kobus* and its variety *borealis* is most noteworthy and a particularly fine feature with every branch crowded with the small white fragrant flowers (Fig. 121).

Also flowering before the leaves appear is possibly the finest of all the pure white magnolias—*M. denudata* (syn. *conspicua*). Of the several specimens to be found in the gardens, the largest is in the Azalea Garden. It is 17 feet high and has a branch span of 25 feet. Another good tree is situated just inside the Cumberland Gate, and where it is seen to advantage against a background of trees and shrubs. Both these specimens are old, but there is no record of the date of planting. This Chinese species is singularly attractive with its erect chalice-shaped blossoms that are produced freely and in succession, often well into the month of May. Commonly called the 'Yulan', this magnolia is one of the best for general planting, but it should always be given ample space to allow free development.

After growing for many years there are now two noteworthy specimens of *M. campbellii* that have during the past few years begun to flower freely. The better of the two, and also the one with the deepest coloured flowers, is the tree near Victoria Gate. It came to Kew as a small plant in 1904 and after 55 years has reached a height of 35 feet and with a branch span of 30 feet. This spring well over 500 of the large rosy-pink blossoms were produced and presented a most pleasing and colourful feature (Fig. 120). Whilst this specimen and the number of flowers produced cannot compare with the large and free-flowering specimens of this magnolia growing in west country gardens, it is nevertheless a very creditable specimen for the London area, where the atmospheric conditions particularly are not good for this and other Himalayan magnolias. The other large tree of *M. campbellii* grows in the centre of a mixed planting of magnolias near the Azalea Garden. It is probably about the same age as the previously mentioned tree, being 27 feet high and 36 feet span. Its more spreading habit is chiefly due to a forked trunk, but at the same time it has had more growing space. So far it has not flowered freely but the flowers produced have been larger, although I question if the form and colouring is quite so good. No garden having space to devote to large magnolias should be without this magnificent species and although it may be a matter of planting for posterity, the foliage and habit is most pleasing.

Closely allied to *M. campbellii* and now considered by botanists to

be a geographical subspecies of it, is *mollicomata*. Similar in both habit and form of flower, the difference is only in the colouring of the flowers which are pinkish-mauve at Kew, but this may vary according to soil and local conditions. There are two fairly tall specimens in the collection near Victoria Gate that in most seasons produce a goodly number of the large and rather loosely formed flowers during early April. The largest tree, which originally came from Caerhays Castle, Cornwall, was planted in 1914 and is now 29 feet high with a branch span of over 21 feet.

A tree of both *M. campbellii* and subsp. *mollicomata* may be seen in the Himalayan section of the Temperate House and it was with flowers of these that the late MR. C. P. RAFFILL made his cross in 1946. From the seeds obtained about 100 plants were raised and many of them distributed to British Gardens during 1948–9. It is interesting to record that the first of these seedlings flowered this year (early April) at Windsor Great Park; flowers being shown at the R.H.S. Hall, Vincent Square, and afterwards sent to the Kew Herbarium for examination. This hybrid has been named 'Charles Raffill' (*M. campbellii* ♀ × *M. campbellii* subsp. *mollicomata* ♂). The two flowers received at Kew from Windsor Great Park were large with intense colouring as in *M. campbellii*, but with the colour itself as in the *mollicomata* parent (i.e. rosy-purple). There are a number of specimens at Kew of this hybrid, all planted in varying positions—some in the open, others in woodland. They have grown reasonably well, but their progress cannot be compared with the specimens at Windsor or in some other districts.

In the centre of the Cambridge Cottage Garden (Duke's Garden) there is a very nice specimen of *M. veitchii*, another *M. campbellii* hybrid (*M. campbellii* × *denudata*). The tree to be seen is a very good form and in most seasons flowers with great freedom; the lovely large tulip-like blossoms are seen to advantage against a background of other trees and they are enhanced by the mown carpet of grass beneath the spreading branches. Although this specimen is not large compared with the examples of *M. veitchii* one finds in Cornish Gardens, it is particularly attractive because the flowers can be viewed close up and their wonderful texture and colouring appreciated. The tree which was received as a small plant from Messrs. Veitch of Exeter in 1922, now measures 32 feet in height and has a span of 30 feet. Two other specimens of approximately the same age are to be seen near the Azalea Garden, one of them labelled as forma *alba* is almost pure white.

M. × *soulangiana* is the magnolia most familiar to visitors to Kew, there being numerous examples of this fine hybrid to be found in various parts of the gardens. Noteworthy among them are the trees immediately inside the Main Gate which each year provide a spectacular display. There is another specimen quite 20 feet high and well proportioned near the Lion Gate that flowers with remarkable freedom and continues with a sprinkling of blossoms until early June. It is this prolonged habit of flowering that is so valuable and renders *M. soulan-*

giana such a good garden subject. For sheer weight and quantity of blossom we must go to the Azalea Garden to view the oldest specimen of this magnolia (pictured in colour in the June issue of the R.H.S. *Journal*, Vol. 84, Part 6).

It is of rounded habit and measures 22 feet high by 35 feet wide, the trunk having a girth of over 4 feet at 12 inches above ground level. Each year this specimen is covered with its lovely tulip-like flowers that are white on the inside and shaded or stained with lilac or purple at the back of each petal. The tree makes little growth but each short twig is terminated by a flower with the result that they are so thickly clustered that the whole tree is adorned with a majestic display that is never equalled by any other magnolia at Kew.

A number of varietal forms add to and prolong the display of *M. soulangiana*, and of them 'Rustica Rubra' is possibly the best. Several specimens are to be found in the grounds but again the best of them is in the Azalea Garden. It is shrubby in habit, yet reaches a height of 23 feet and with a span of 33 feet. The large globular and more richly coloured flowers with a pearly-white lining to the thick textured petals, provide each year a rich and satisfying feast of colour. Other named varieties are represented; one of the best being the lovely white-flowered 'Brozzonii', while 'Alexandrina', 'Superba' and 'Spectabilis' may also be mentioned for they vary in the colouring of the flowers, the latter being almost pure white. Most of these varieties of *M.* × *soulangiana* are represented by quite large specimen trees or bushes, many of them quite 50 or more years of age. This should not deter would-be planters, because this magnolia and its varieties begin their flowering quite early as small shrubs and do not quickly attain large proportions. They are therefore excellent for the smaller garden, provided conditions are suitable.

Closely allied to *M.* × *soulangiana* and sometimes listed as a variety of it, is *M.* × *lennei*. It is without question one of the most beautiful of all hybrid magnolias and although said to be of similar parentage as *M.* × *soulangiana*, it does differ in having larger leaves and more richly coloured rosy-purple flowers. The season of flowering is an extended one—the first blossoms opening at the end of April and continuing throughout May. The specimens at Kew often produce a second crop of flowers in the autumn, but it is a fleeting display. The largest specimen is in the centre of the Azalea Garden, being 12 feet high and over 30 feet wide. When in full flower this specimen presents an unforgettable feature.

M. liliiflora, a species introduced from Japan in 1790, is also well represented and excellent shrubby specimens are to be seen in several parts of the gardens. They are conspicuous from late April until June, when the slender lily-like flowers are freely produced. They measure about 3½ inches in length and are borne erectly at the ends of short shoots; the outside of the petals being a rich vinous purple and creamy-white inside. Two varietal forms may be mentioned—*nigra* with larger

and deeper coloured flowers, and *purpurea*, which has even larger flowers that are deep purple on the outside of the petals. This species and its varieties can be recommended for planting in small gardens and even quite old specimens at Kew have not reached large proportions. The biggest is 8 feet high by 10 feet wide and is probably 70 years old.

There are a number of specimens of the North American species—*M. tripetala*, the largest 24 feet high by 19 feet wide, and over 35 years old. Whilst this species can only be considered for large gardens and in particular semi-woodland planting, it is of value because of its later flowering and also on account of the sweet scent of the large creamy white flowers. The trees bear handsome foliage and they are also attractive in autumn when bearing the cone-like fruits that colour rosy-red as they ripen.

M. obovata (syn. *M. hypoleuca*), a tree-like Japanese species, is represented by several large specimens that each year produce during early June a number of large creamy-white and richly scented blossoms that are viewed to advantage against the large obovate leaves. Each flower opens flat to display the attractive central ring of reddish stamens. The finest tree at Kew is situated near the Victoria Gate and is over 30 feet high and about 16 feet wide. It came as a small plant from the Yokohama Nursery Company, Japan, and was planted in 1908. Nearby is quite a reasonable (15 feet) tree of *M.* × *watsonii*, and which is reputed to be a hybrid between *M. obovata* and *M. sieboldii*. It is a more desirable plant for general planting than *M. obovata*; also the ivory-white flowers with an aromatic scent measure 5 to 6 inches across and have an attractive centre of red stamens. They are produced in succession from early June until mid-July in most seasons.

Smaller growing magnolias, particularly those of bushy habit that will prolong the flowering season, are particularly useful and in *M. sieboldii* (syn. *M. parviflora*) we have one of the most desirable of garden shrubs. At Kew this species from Japan and Korea, is well represented in woodland planting and also as an ornamental shrub in formal beds. The flowers, 3 to 4 inches across, saucer-shaped and pure white, are produced singly at the ends of the growths. They are highly scented and have a most attractive centre of rosy-purple stamens, while the flowering period extends from late May until August. Of equal merit are *M. sinensis* and *M. wilsonii*, both shrubby species native of Western Szechuan, China. *M. sinensis* resembles *M. wilsonii* in habit and flowers except that they are larger, while the leaves besides being more rounded have a distinct covering of silky hairs on the underside, especially on the mid-rib. This magnolia is also to be recommended because it does tolerate limy conditions and will grow in full sun. *M. wilsonii* is also a good garden shrub, being chiefly distinguished from *M. sieboldii* by its narrower leaves, darker bark and more pendent flowers. At Kew it forms a rounded bushy specimen, but definitely requires shade or at least, semi-shade to grow well. There are, I believe, two forms of this

species in cultivation, one small and bushy with narrow leaves, the other of taller habit and with broader and larger leaves.

Other species of magnolia to be found at Kew, include *M. cordata*, a North American species with pale yellow blossoms about 3 inches across and in some seasons freely produced. The best specimen planted in 1906 is now 18 feet high and has a branch span of 17 feet.

Another yellow-flowered species is *M. fraseri*, a native of the south-eastern United States. There are two specimens; the largest in the Azalea Garden is 30 feet high and has a branch span of 25 feet. It bears its large pale yellow flowers (often 9 inches or more across) at the ends of leafy branches during late May and early June.

M. macrophylla, a very large-leaved species from the south-eastern United States, is not too hardy at Kew, but a specimen some 10 feet high growing near the Azalea Garden has in recent years produced a number of its large fragrant creamy-white flowers.

M. acuminata, the 'Cucumber Tree', and its varieties *maxima* and *variegata*, can be seen as large trees on the open lawns, while in more woodland settings there are specimens of *M. officinalis*, *M. sargentiana*, *M. sprengeri* and *M. thompsoniana*.

Of the evergreen magnolias, there are of course a number of specimens of *M. grandiflora* and also its varietal forms—*ferruginea*, 'Goliath', *gloriosa*, *lanceolata* and *undulata*. Some are grown as wall specimens on the walls of the Museums, while others grow as ordinary tree or bush specimens in the collections near Victoria Gate and the Azalea Garden. It is, however, the wall trees that provide the large globular blossoms up to 10 inches across with their creamy-white petals and aromatic fragrance, for which this southern United States species is noted. They are produced during late summer and command much attention.

There are two specimens of the 'Swamp Bay' *M. virginiana*, situated on the lawn opposite the Wild Garden, that each year produce a succession of their creamy-white globular flowers from July until late October. Each flower is from 2 to 3 inches long and very sweetly scented; they will last quite a long time, but do become discoloured with age. At Kew this species is really a semi-evergreen but quite hardy and grows freely, the largest tree being 15 feet high and as much wide.

M. delavayi, an evergreen species native of Yunnan, China, is represented as a wall specimen in the Herbaceous Garden. It grows freely but does not flower. It has the largest leaves of all the magnolias and is worthy of cultivation purely as a foliage subject, for the leaves are dark green above and glaucous beneath.

In conclusion, mention must be made of two hybrid magnolias that have occurred at Kew as a result of natural open flower pollination. One is *M.* × *kewensis*, which is a cross between *M. salicifolia* and *M. kobus*. It is intermediate in both floral and foliage characters between the two parents and trees of it are growing with remarkable freedom. The largest tree situated near King William's Temple is now over 25 feet in height and has a span of 18 feet. The creamy-white

flowers are freely produced in advance of the foliage and young trees commence to flower quite early and before they reach sizeable proportions. Cut branches from the above-mentioned tree received an Award of Merit when shown before Floral B Committee on April 8, 1952.

The other hybrid is a cross between *M. tripetala* and *M. sieboldii*. It is intermediate in habit, with fairly large leaves and a semi-bushy habit—the largest specimen being about 12 feet high and 15 feet wide. It has flowered freely during the past two years during mid-May, but unfortunately not at a time to coincide with a R.H.S. Show, to enable good examples to be shown. The creamy-white flowers are rather like those of *M. tripetala* but have a more conspicuous centre of reddish stamens and are very fragrant. It is proposed to name this hybrid in honour of MR. C. F. COATES, who was Propagator-in-charge of the Arboretum Nursery at Kew for many years and was responsible for the collection of the self-sown seedlings of both these hybrid magnolias.

BIRD DAMAGE TO HORTICULTURAL CROPS

E. N. Wright, B.Sc.

(*Lecture given on June* 9, 1959, H. V. TAYLOR, C.B.E., D.SC., V.M.H., *in the Chair*)

MANY species of birds thrive in a garden habitat. Shrubberies provide places in which to roost, to build nests and hide from enemies but, above all, a plentiful supply of food, often consciously supplemented by the householder, is to be found there. Predators are few and consequently the bird population of gardens, although restricted in variety, is greater in density than that found under natural conditions.

Damage may be defined as "loss to man" and it is generally understood to mean loss of food. However, many gardens are cultivated solely for their aesthetic value and for the purpose of defining damage the production of flowers is analogous to the production of food. The greater part of all bird damage occurs when the birds' feeding habits clash with the agricultural and horticultural interests of man. This can hardly fail to occur in gardens from time to time. We may call this "feeding damage" and it is useful to divide it into that occurring to growing plants, including newly sown seeds, and that done to ripe crops. At harvest time birds take food that would have been eaten by man or fed to his domestic animals. That is to say that birds and men enter into direct competition for the available food and at this time the quantitative measurement of bird damage is relatively simple. On the other hand, the evaluation of damage to the growing plant is very difficult owing to the recuperative power of the plant and the influence

of other factors on crop yields. However, some damage appears to be unconnected with feeding and although the activity has clearly been purposeful the motive is obscure; we may call this "mischief damage". Lastly, damage may occur as an adjunct to some otherwise harmless bird activity and we may call this "incidental damage".

Bird damage to ripe fruit must be one of the best known examples of feeding damage on a ripe crop. All fruits as they ripen, and even before, are eaten by birds of many species. In gardens blackbirds, missel and song thrushes and starlings are the chief offenders but in orchards jays, magpies, rooks and wood-pigeons join the attack. Wood-pigeons in particular consume large quantities of small, unripe currants, cherries and plums, and this bird is becoming a pest of suburban gardens too, overcoming its natural timidity to exploit this source of food. Tits do a lot of damage to ripe apples and pears by pecking them on the "shoulder" near the stalk. The wound they inflict is usually small, often only a few pecks, but each bird may spoil many fruits. Dessert fruits suffer most of all and the largest, most highly coloured specimens appear to be singled out for attack. However, this may only be because they are borne on the outermost branches where they are most vulnerable. Other birds or wasps may find these damaged fruits and enlarge the wound but almost inevitably the wound becomes infected by brown rot. This may affect adjacent fruit whilst still on the tree or, which is more serious, the damaged fruit may be put into store and be a source of infection there. During the summer of 1957 fruit pecking by birds was particularly severe and in one orchard of 'Conference' pears in Kent, where counts were made, 15 per cent of the fruits had been damaged in this way. Individual trees showing up to 25 per cent damage were recorded and damage in gardens may reach even higher proportions. Some damage to fruit occurs every year but the 1957 outbreak appeared to be correlated with an exceptionally large immigration of tits from the Continent. Fortunately for the fruit grower these "invasions" do not occur every year.

Other garden crops suffer damage when almost mature. Peas and, to a lesser extent, broad beans are taken by house-sparrows, tits, wood-pigeons, jays and other corvids just as the pods are beginning to fill. In winter, especially during hard weather, wood-pigeons attack brassicae and besides devouring some plants render many more unfit for use through fouling.

Damage to the growing crop can be even more serious than that done at harvest time. A small amount of damage to a seed bed or to dormant buds can destroy a crop in embryo and it follows that a few birds eating buds or drilled seeds can do as much damage as many birds eating the ripe crop. During recent years damage by bullfinches to the buds of trees, especially fruit trees, has greatly increased. However, it is not new and reference to the destructive habits of these birds can be traced back to Elizabethan times. LAWSON (7), writing in 1618, said: "The Bul-finch is a devourer of your fruit in the bud . . ." and two

hundred years later ROBERT MUDIE (8) wrote: "When the stores of the coppice fail, and the weather is severe, the bull-finches resort to the gardens, and commit very considerable ravages upon the fruit trees, especially the early cherries, plums, and other sorts that have their buds in an advanced state, and with a considerable amount of farinaceous matter accumulated in them". The horticultural literature of the present century contains many references to bullfinch damage and in 1935 the British Trust for Ornithology conducted an inquiry into The Destruction of Buds of Trees and Shrubs by Birds, the results of which were published in 1939 by Fryer (3).

Local names for the bullfinch are bud-finch and pick-a-bud and are derived from the fact that during the winter they feed almost exclusively on buds. Although the buds of many wild trees are taken those of cultivated trees, especially fruit trees, are very attractive to them. They are ruthlessly efficient in their method of stripping the buds and they work systematically along a branch or spur taking every one. Individual bullfinches have been observed disbudding plums at the rate of 54 a minute but a more usual feeding rate is about 30 buds a minute. In winter they forage in small parties and, with several birds feeding at this rate, damage soon becomes apparent. Where only a few trees are involved they may be stripped of buds before the owner realizes they are being attacked. Only the centre part of each bud is eaten and the discarded bud-scales litter the ground beneath the trees in which bullfinches have been feeding. This is normal feeding behaviour, wasteful perhaps but not just mischievous damage.

Damage occurs from November until April but it is unusual to have severe damage before mid-December. The buds of different kinds of fruit trees are attacked at different times of year and very marked preference is shown for certain varieties. This varietal preference can be seen on all kinds of fruit, but it is most striking on pears and was the subject of an article by P. BECKER and E. G. GILBERT (1) in the December 1958 issue of this JOURNAL. Preferences differ locally and change from year to year but in general dessert varieties suffer most damage, cherries are an exception and the acid variety Morello suffers severely.

In gardens the buds of ornamental trees and shrubs may be taken together with those of fruit trees. *Forsythia* buds are usually taken before any others but bullfinches are very fond of the buds of ornamental *Prunus*, especially *P. pissardii*, which is often completely stripped of blossom buds. Other ornamental trees which may be attacked are flowering cherries, crabs, *Wistaria*, *Viburnum*, *Syringa* and cultivated hawthorns and willows.

Buds are taken by other birds besides bullfinches, although they are the chief offenders, and house-sparrows can cause considerable damage especially to plums and gooseberries. Damage may occur wherever sparrows congregate such as near houses, rick yards or poultry runs. By inspecting the damage it is often possible to determine which species of bird was responsible. Whereas bullfinches remove buds systematically

and neatly, sparrows take them in a more random manner and leave ragged circles of bud tissues uneaten.

In an attempt to assess bird damage to fruit buds quantitatively the yields from two plots of 'Leveller' gooseberries were compared. As far as could be ascertained both plots were growing under near identical conditions except that one plot, which was near a shrubbery, had suffered severe bud damage every winter for a number of years, whilst the other showed no signs of bird damage, past or present. The undamaged bushes yielded 670 lb. of fruit, an average of 16¾ lb. per bush, but the damaged bushes produced only 197 lb., an average of less than 5 lb. per bush. The low yield of the damaged bushes was not due solely to bird damage during one season but resulted from the cumulative effect of damage over a number of years. In spite of expert pruning the bushes were mis-shapen and carried much bare, unproductive wood; as a result of this, even in the absence of bird damage, they would be incapable of producing a good crop in future years. This long-term effect of bird damage to buds can often pass unnoticed until the productivity of a fruit garden or orchard falls to the point where grubbing is the only practical solution.

Newly sown seeds may be dug up and eaten or the seedlings uprooted after germination. House-sparrows, greenfinches and linnets are the chief culprits in gardens but in rural districts corvids may take the larger seeds such as peas and beans. House-sparrows also attack young lettuce, carnations and chrysanthemums by pecking off the leaves, whilst wood-pigeons devour transplanted brassicae. These attacks check the plants rather than kill them but they upset the cropping plan and may spell ruin to the commercial grower.

A great deal of bird damage occurs for no apparent reason, the plant being simply uprooted or torn to pieces with little evidence of it being eaten. The damage done to spring flowers by house-sparrows is of this nature, primrose and *Polyanthus* flowers being torn up and the petals scattered, while crocuses and early flowering irises are simply pecked near the base so that they topple over. FRYER suggests that flower tearing may be concerned with display, and certainly most of this damage occurs in spring when this behaviour is at its peak. However, not all flower pecking is "mischief" damage and bullfinches often feed on flowers, nipping out the ovary and dropping the corolla, intact, to the ground. Wood-pigeons will strip blossom from plum and cherry trees but again this seems to be feeding activity rather than mischief.

Incidental bird damage, other than fouling, is not common but there are a few outstanding examples which are important in certain circumstances. Young trees may break under the weight of a large bird, such as a rook or a wood-pigeon, and although conifers seem particularly prone to this type of damage it also occurs to young fruit trees. When communal starling roosts are established in trees, quite large branches may break under the weight of birds and if a roost is used for any length of time all the vegetation beneath the trees, and even the trees themselves,

will be killed by accumulated faeces. Birds bathing in watercress beds disturb the anchorage of the plants, which then float away. Waterfowl have always caused a certain amount of damage in this way but blackbirds, thrushes and starlings are becoming very troublesome on the outskirts of large towns. In dry weather house-sparrows spend a lot of time dust bathing, occasionally they will expose the roots of a plant and cause it to die but it is the seed bed that suffers most. The birds like the fine tilth and disturb the carefully prepared surface by dust bathing. In doing this they often expose some of the seeds, which are promptly eaten, and this accidental discovery may lead to deliberate attempts to find more.

There are many ways in which the farmer or gardener may attempt to protect his crops but only the erection of a cage, permanent or temporary, can give complete protection. When the crop is extremely valuable or grown on a small scale, as in gardens, a cage may be considered worth while. In America the production of paper-string netting, which is both cheap and durable, in continuous lengths up to 500 yards has made the caging of quite large areas economic. In gardens it is not uncommon for individual fruits, usually pears, to be protected by paper or polythene bags placed over the fruits and tied round the stalk. During the winter the buds of bush fruits may be protected by covering the bush with a sack, and straw or bracken are sometimes used for the same purpose in commercial gooseberry plantations. Black cotton is a standard remedy against house-sparrows but it is not always effective. When protecting a seed bed in this way, it is best to have the cotton about 3 inches above the ground stretched tautly between sticks and criss-crossed above the drills. Recently the same technique has been used, on a larger scale, to protect field crops from wood-pigeons. Posts about 3 feet high are erected at roughly 20 yard intervals and a thin strong wire, which is stapled to their tops, is stretched between them. Pigeons coming in to feed on the crop appear to have difficulty in avoiding the wires and are deterred from settling. Fields protected in this way will have to be cultivated by hand, consequently use of the method is likely to be limited to small areas such as experimental plots.

It is more usual to use "scarecrows" of one form or another in the hope of frightening the birds away. Unfortunately these traditional methods are not very effective because birds quickly get used to them. By ringing the changes and by using objects that move or glitter, the learning process may be delayed but, unless the stimulus ultimately leads to an unpleasant experience, it cannot be prevented. In other words, to be effective the scarecrow must occasionally turn out to be the farmer in disguise. It is entirely wrong to think that birds will be frightened by the same things that alarm man. The bird population of an artillery range has been shown to be thriving under conditions that would terrify most men but many birds will flee at the sight of the "eye" pattern on the wings of a butterfly. Most birds have inborn fear responses which are released by certain stimuli; for example the shape

of the head and neck of a predatory bird is a stimulus that releases an escape response in most passerine species. The action is involuntary but the response will wane if the stimulus is encountered too often without being reinforced by the real thing. There is, therefore, a sound biological basis for using as scarecrows models of animals which normally prey on birds although the practical difficulties reduce their value. The more lifelike the model the more intense will be the response and the important features are correct shape, especially of head and neck, solid form and correct coloration. Models should be presented in a natural way and, above all, they should not be left in the same position day in and day out but should be used only in short spells to protect crops in their particularly vulnerable stages. This applies to all scarecrows and is one reason why they are of little value in protecting crops in which the stage of development which suffers damage is a long one. The extreme example is dormant buds which are vulnerable for five months of the year.

Another "biological" method of scaring birds is to record the alarm or distress calls of the species it is desired to frighten away and to play back the recording to birds in the field. Thus the recorded distress call of starlings has been used to drive these birds from their roosts, apparently with greater success in America than in this country. Birds respond only to the calls of their own species, with some overlap between related species that normally associate together, e.g. crow, rook and jackdaw, and there is no "universal" alarm call that will scare all birds. This system, which has many biological and technical drawbacks, shows some promise as a specialist technique but is unlikely ever to find general application, for example, in gardens.

The use of ultra-sonics for scaring birds receives occasional publicity but the experimental evidence shows that birds respond only to sound frequencies that lie within the range normally audible to man. The use of a "silent" bird scarer analogous to the "silent" dog whistle seems to be out of the question.

The idea of treating crops with a chemical that will render them unattractive to birds has recently gained in popularity. Nowadays there is some chemical treatment for most plant pests, why not one for birds? Theoretically, at least, a repellent substance could be easily applied like other agricultural chemicals and would prevent damage without killing the birds. The use of alum, quassia or bitter aloes to repel birds has been recommended for years, presumably because they taste unpleasant to man, but under critical test they seemed ineffective. ENGLISH (2) reports that many other chemicals have been tried as a protection for buds against bullfinches but without significant success. Chemical repellents are generally thought of as acting through the sense of taste and most of the chemicals tried seem to have been selected on the basis of their unpleasant taste to man. This implies that birds can taste in much the same way as mammals, but there was little basis for this assumption until KARE (6) and more recently DUNCAN (in preparation) showed that

birds can discriminate between substances that, to man, have a strong taste. DUNCAN found that feral pigeons rejected drinking water containing alum and this seemed to support traditional belief. Unfortunately they readily ate food treated with the same substance. In a similar series of tests I found an even more marked rejection of water containing thiram, diphenyl guanidine or beta-naphthol at concentrations as low as 0·05 per cent, yet field trials with these chemicals have failed to detect any significant repellent action. Clearly, the response by a bird to a chemical repellent varies greatly and depends on conditions about which we know very little. Past failures of field trials may be attributable, in part, to inadequate persistence of the spray residue and a search is being made for more efficient "stickers". At the same time DUNCAN has expressed the opinion that the sense of taste in birds does not exert a controlling influence over their feeding habits and, if this is so, a repellent acting solely through the sense of taste is unlikely to prove more than partially effective.

Taste is not the only sense through which a bird, or any other animal for that matter, might be repelled. Closely allied to taste is the olfactory sense and substances having a strong smell might be expected to be repellent. Naphthalene is one of the substances for which repellent claims have been advanced on the basis of its smell, but the evidence is unconvincing. When used in the form of crude "whizzed" naphthalene, "mothballs" or a 60 per cent wettable powder it failed to prevent bullfinch damage to gooseberry buds, even for a few hours. According to STURKIE (9) the sense of smell in birds is poorly developed and the bulk of experimental evidence supports this view, it would be surprising therefore if smelly substances were found to exert any significant repellent effect.

On the other hand the tactile sense is well developed in birds. The "feel" of food is thought to be very important, especially to seed eaters. They also avoid perching on greasy or sticky surfaces. The use of tree banding grease has been advocated for the prevention of bird damage to fruit tree buds and if a thorough application is made it certainly achieves this end. However, not all trees will tolerate a heavy application of grease and bark splitting combined with corky outgrowths from the lenticels has been noted on young pear trees so treated. It must also be borne in mind that if the grease is applied in excess there is a danger that it will contaminate the birds' plumage or actually catch very small birds. In these circumstances the grease may be deemed to be a bird-lime, the use of which is prohibited by the Protection of Birds Act 1954.

Birds have good eyesight and their colour vision is similar to that of man, although some species of birds see colour at the blue end of the spectrum rather poorly. Early experiments appeared to establish that chickens would not feed on blue coloured grain but later workers were unable to confirm this. KALMBACH and WELCH (4) and (5), working in America, found that brilliant green was the most effective colour in

deterring birds and brilliant yellow the next best. In this country yellow distemper has been reported as giving some protection to the dormant buds of fruit and decorative trees against attack by bullfinches but ENGLISH reported that gentian violet did not prevent damage to buds of plums and blackcurrants. Colour repellents are probably best used to reinforce taste repellents.

No matter how a substance acts as a repellent, to be of practical value it will need to possess certain characteristics, which may be summarized as follows:

1. It must repel birds.
2. It must not be toxic to man or other animals or harmful to plants.
3. It must not taint or otherwise affect the usefulness of the final crop.
4. It must be chemically stable and adhere to the crop under exposure to normal climatic conditions for a reasonable length of time.
5. It must be formulated so that it can be applied by normal farm or garden equipment.
6. The cost must be reasonable.

Requirements 1 and 2 are fundamental and no substance has been found which fulfils both these conditions satisfactorily although some progress is being made.

Some mitigation of bird damage may be achieved by attention to cultural methods. For instance, bullfinch damage may often be greatly reduced by removing hedges and thickets from round orchards and fruit gardens. This is because the bullfinch is a shy bird and will seldom venture far from natural cover. If fruit trees have to be planted near to cover which cannot be removed then the varieties highly susceptible to bird damage should be avoided. Local knowledge is the best guide but in general, gage plums, 'Leveller' gooseberries, Morello cherries, 'Cox's Orange Pippin' and 'Lord Lambourne' apples and the pear varieties 'Williams' Bon Chrétien', 'Laxton's Superb' and 'Dr. Jules Guyot' suffer most damage. Another cultural technique that is useful is to leave pruning as late as possible, if damage has occurred it can then be allowed for. The seed bed can sometimes be protected by planting the seeds a little deeper than usual and if the surface is kept moist it cannot be used for dust bathing. If any seed is spilled it should be cleaned up and not allowed to lie on the surface to attract birds, which may then dig up the rest of the seed bed. If bird damage is of the "incidental" type it may be prevented by removing the source of attraction, for example woodpeckers scratch holes in lawns when searching for insects and this might be prevented by treating the turf with an insecticide.

Sometimes the only way of protecting a crop is to kill the birds that

are doing the damage. Shooting* is the usual method employed, using shot size No. 6 for large birds, such as wood-pigeons, and No. 9 for small birds such as sparrows and bullfinches. Cage traps can be used to catch birds and the ladder or cone entrance Rook Trap, Sparrow Traps and the Chardonneret Trap (for bullfinches) may all aid the gardener in the difficult task of protecting his crops from the ravages of birds.

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BOOK NOTES

"Plants and Environment. A textbook of Plant Autecology." Second edition. 8vo. 421 pp. By R. F. Daubenmire. (John Wiley & Sons.) 56*s*.

The fact that this book has passed into a second edition is sufficient evidence that it meets a need. A number of chapters treat of a sequence of factors, namely, soil, water, temperature, light, atmosphere, fire and the biotic factor. But in these the treatment is general rather than special and indeed sometimes, as in such matters as soil aeration or the trace-elements, it is meagre to the verge of superficiality.

There is much in the text that a beginner in the study of the relation of plants to their surroundings could read with both interest and profit but the sub-title, and the claim on the dust cover, that this provides "a complete coverage of plant autecology" is misleading, for there is little attempt to integrate the influence of operative environmental conditions with the diversity of specific response. Nor does one find here a guide to the significant biological features of the adult individual or its developmental phases as one might reasonably expect in a work purporting to be written from this angle of approach. The two final chapters on the environmental complex, ecological adaptation and evolution, do little to remedy this and indeed the former, though emphasizing habitat complexity, gives but slight guidance regarding the interaction of factors within the environment such as well-chosen specific examples could have provided.

* The law in relation to the protection of wild birds other than game birds is embodied in the Protection of Birds Act, 1954. This Act protects all wild birds in Britain but allows certain species to be shot for sport and harmful birds (specified in the Second Schedule) to be killed at any time on private land by the owner or occupier or any person shown to have been authorized by either. The Schedule includes the crow, rook, jackdaw, jay, magpie, feral and wood-pigeon, stock dove, house-sparrow, starling and, in certain specified fruit growing areas, the bullfinch. The Act further provides that a person shall not be found guilty of killing a protected bird (other than a specially protected bird) if he satisfies the court before whom he is charged that his action was necessary to prevent serious damage to crops or to property.

The bibliography of approaching 800 references, of which about 15 per cent are of publications of the last decade, is notably weak in citations to studies of the more biological aspects or to autecological monographs.

E. J. SALISBURY

"Tree Maintenance." By P. P. Pirone. Third edition. 483 pp. Illus. (New York—Oxford University Press.) 70*s*.

Dr. Pirone's book on the maintenance of shade and ornamental trees was first published in 1941 under the title of *Maintenance of Shade and Ornamental Trees*, and a revised edition appeared in 1948. To bring the work up to date it has now been reset and rewritten. This third edition includes a great deal of new material and many new illustrations. Since this book first appeared changes have occurred in arboricultural practice in the United States. More is now known regarding methods of transplanting and tending ornamental and specimen trees and foliage feeding has developed on scientific lines: many fine trees are now being saved by new techniques and by the pesticide discoveries of the past twenty years. Although written primarily for American arboriculturists the book is one possessing appeal to all tree lovers, especially to foresters and park superintendents. The author, who writes in non-technical language, deals with all phases of tree culture and protection—soils, pests and diseases, as well as the choice of species for different sites and circumstances. Chapters are devoted to the treatment of wounds; bracing and cabling; the diagnosis of tree troubles, pests and parasites and fertilizers. The book is in fact a mine of practical information and tree-lore from roadside planting to windbreaks. As might be expected the volume is well produced and copiously illustrated: there are comprehensive indices. Welcome space should be available for Dr. Pirone's book on all tree lovers' bookshelves.

W. L. TAYLOR

"The Biology of Mycorrhiza." By J. L. Harley. 233 pp. Illus. (Leonard Hill.) 55*s*.

The well-recognized association of fungi with the roots of plants has given rise to problems of extreme complexity that are vital to everyone who is concerned with the growing of field, garden and woodland crops for the benefit of mankind. The study of mycorrhizas and their functions in the growth of most kinds of plant-life has been the subject of many speculations and experiments not all of which have been conceived and conducted according to methods of biological enquiry.

This book, as the author modestly claims, is an attempt to correlate the known facts, to analyse with care the existing evidence from all sources and to stress the problems that remain to be solved. The author traces, briefly, the history of research into the nature and functions of mycorrhizas as absorbing organs and the relationships of plant and tree roots to the soil flora in general. Part II deals with the ectrotrophic mycorrhizas, mainly to those of forest trees, and describes their typical structures, ecology and importance in forestry practice. Part III discusses the more difficult interpretations of the parts played by the endotrophic mycorrhizas which, in the life-histories of the plants that form their hosts, are today far from generally understood. This volume will prove a valuable and timely addition to the libraries of botanists who are engaged in mycorrhorological research in the fields of agriculture, horticulture and forestry and, in particular, to those interested in the *Ericacae* and to orchid growers and foresters. The author is to be congratulated upon his presentation of the information at present available, his clear analyses and for the suggestions he makes for future research into these most complex aspects of plant growth. The bibliography is exhaustive and there are both subject and authors' indices. The book is well produced and amply and clearly illustrated.

W. L. TAYLOR

"Excursion Flora of the British Isles." By A. R. Clapham, T. G. Tutin and E. F. Warburg. 579. pp. (Cambridge University Press, 1959.) 22*s*. 6*d*. net.

Epitomes of full-scale Floras are almost a tradition in British botany. Sir J. E. Smith's four-volume *English Flora* was quickly followed by a Compendium, and MacGillivray's "potted" version of Withering's *British Plants* must have been nearly as popular as the original work, to judge from the number of copies in the second-hand book shops. The present synopsis will almost certainly share the success of Messrs. Clapham, Tutin and Warburg's earlier and much larger *Flora of the British Isles*.

It is concise without being too terse, and includes all the data likely to be required by the experienced amateur or enthusiastic student. The *Excursion Flora* is hardly a book for the novice, for although the authors provide keys, glossary and explanatory figures their text is so replete with technicalities that one cannot but sense a certain incongruity at the inclusion of such whimsical "English" names as "Jack-go-to-bed-at-noon" and "Bats-in-the-belfry". While on the subject of nomenclature, how delightful to find that the species we all once knew as *Erythraea centaurium*, having metamorphosed through *Centaurium minus* and *C. umbellatum*, now turns a complete somersault and appears as *C. erythraea*. Should further innovation become necessary, let us hope our name-changers will not overlook the claims of *Manypeeplia upsidownia* Lear as an appropriate label for this unfortunate plant. But it is unfair to hold the authors responsible for nomenclatural vacuities, and in every other respect their *Excursion Flora* is an admirable little pocket-book.

R. D. MEIKLE

"Bromeliads: A Cultural Handbook." By Milford B. Foster and other members of the Bromeliad Society. 64 pp. Illus. (The Bromeliad Society, 647 South Saltair Avenue, Los Angeles 49, California, U.S.A.) $3.

The Bromeliad Society, though American in origin, claims to be International and its publications certainly live up to that claim.

Their Cultural Handbook contains an immense amount of information on this family which is not readily available outside the principal horticultural libraries. From the botanical point of view it is most valuable in presenting the most up-to-date and concise key to the Genera and in giving in some detail the principal characteristics of each Genus and its geographical distribution. Unfortunately, however, in Britain one of the important diagnostic characters, fruits and seeds, are not often produced in some genera. What should interest growers here are the study of the many factors and conditions which assist or retard flowering and articles dealing with propagation and pollination and hybridization. The statement that seeds of the most rapidly maturing genera may take (under American conditions) two to seven years to flower is likely to deter all save the enthusiast from that method of propagation. Tillandsias are said to require eight to thirty years to reach maturity from seed.

Another article of direct interest to the grower is that dealing with the terrestrial or epiphytic habit of the different types. In this the author brings out the fact, not generally recognized, that many species are saxicolous, i.e. rock-loving.

The Bulletin published by the Bromeliad Society is also diverse and interesting. One issue (*Bull.*, No. 6, Nov./Dec. 1958) was devoted entirely to the pineapple, *Ananas comosus*. It deals with its history, cytology and breeding, economic properties and use in art. It also brings out the point that the two variegated varieties belong to different species, the first and best known being *A. comosus variegatus*, the second is newly described as *Ananas bracteatus* (Lind) Schult, var. striatus M. B. Foster.

G. W. ROBINSON

"The School Garden." Book 3. By J. E. Hancock. 245 pp. Illus. (Macmillan & Co. Ltd.) 8*s.* 6*d.*

Teachers of gardening who have used Books 1 and 2 of *The School Garden* will welcome the appearance of Book 3. This volume contains four chapters on soil science and they include suggested experiments in soil-testing. There is an ambitious chapter presenting an introduction to Mendel's principles of heredity. The chapter on manures and fertilizers contains some practical advice about the trace elements. This is a book which will be of interest to amateur gardeners as well as students: it is well-illustrated and has a full index.

P. F. STAGEMAN

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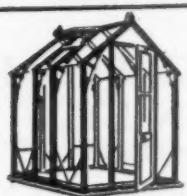

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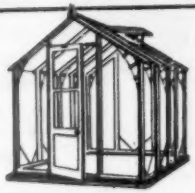

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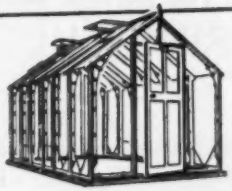

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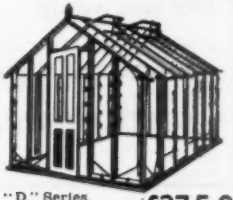

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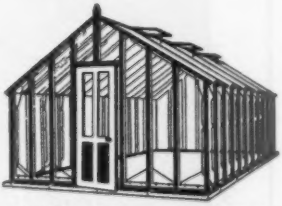

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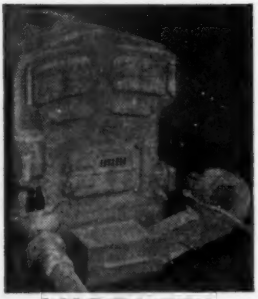

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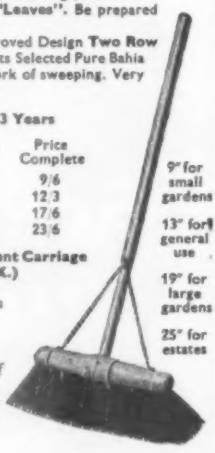

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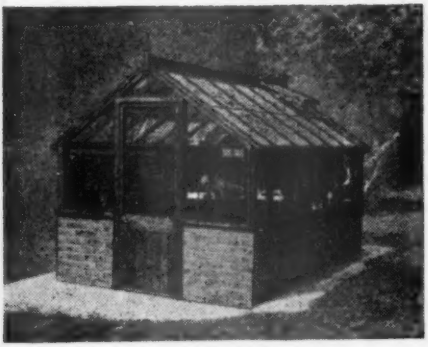

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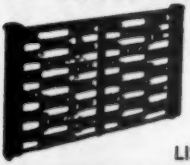

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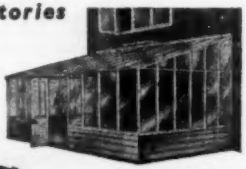

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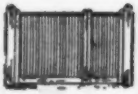

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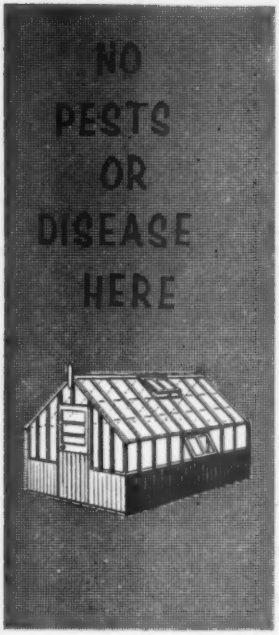

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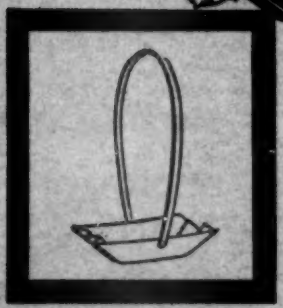

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